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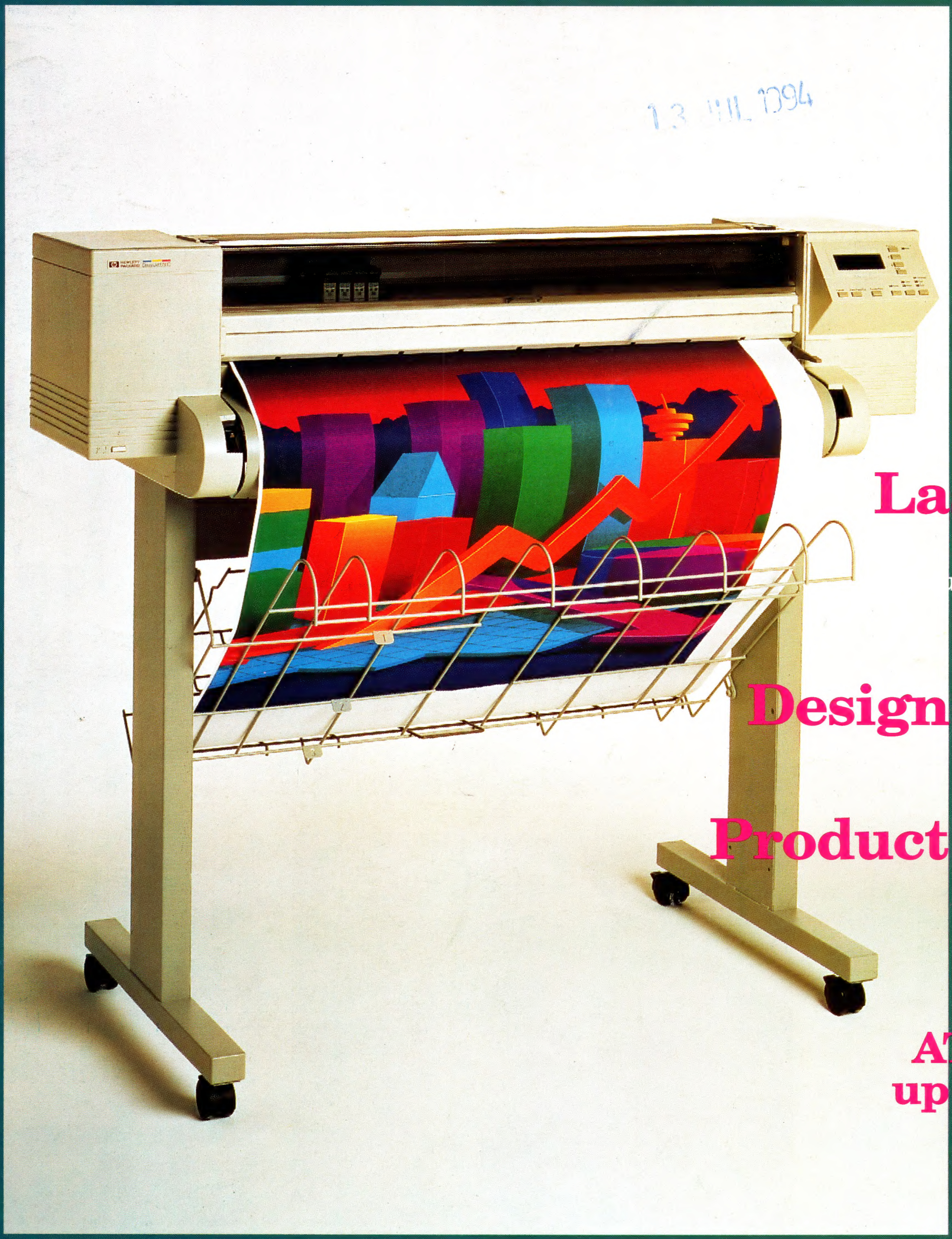

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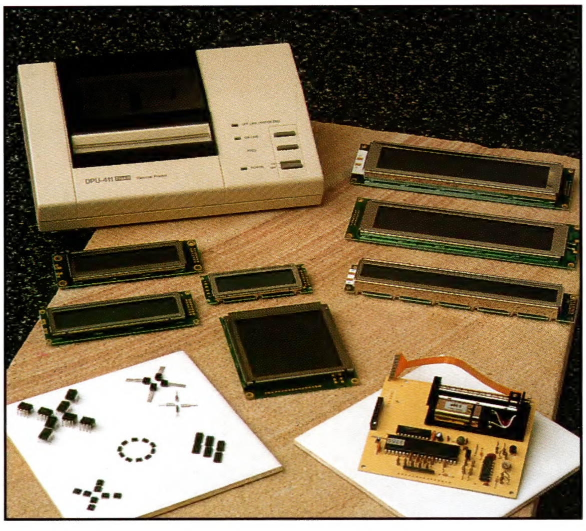

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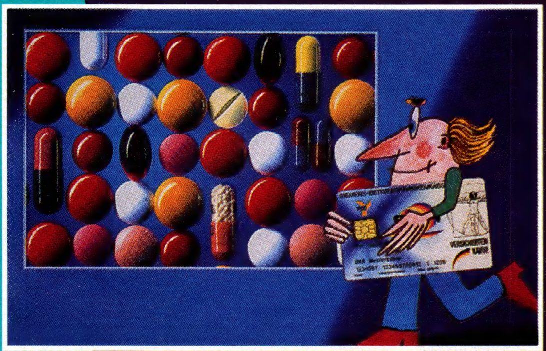

This month:

Smart card technology is already revolutionising traditional business transactions. See page 34.

NEED INFORMATION QUICKLY?
AEE's new Fast Fax enquiry system will help. See page 85.

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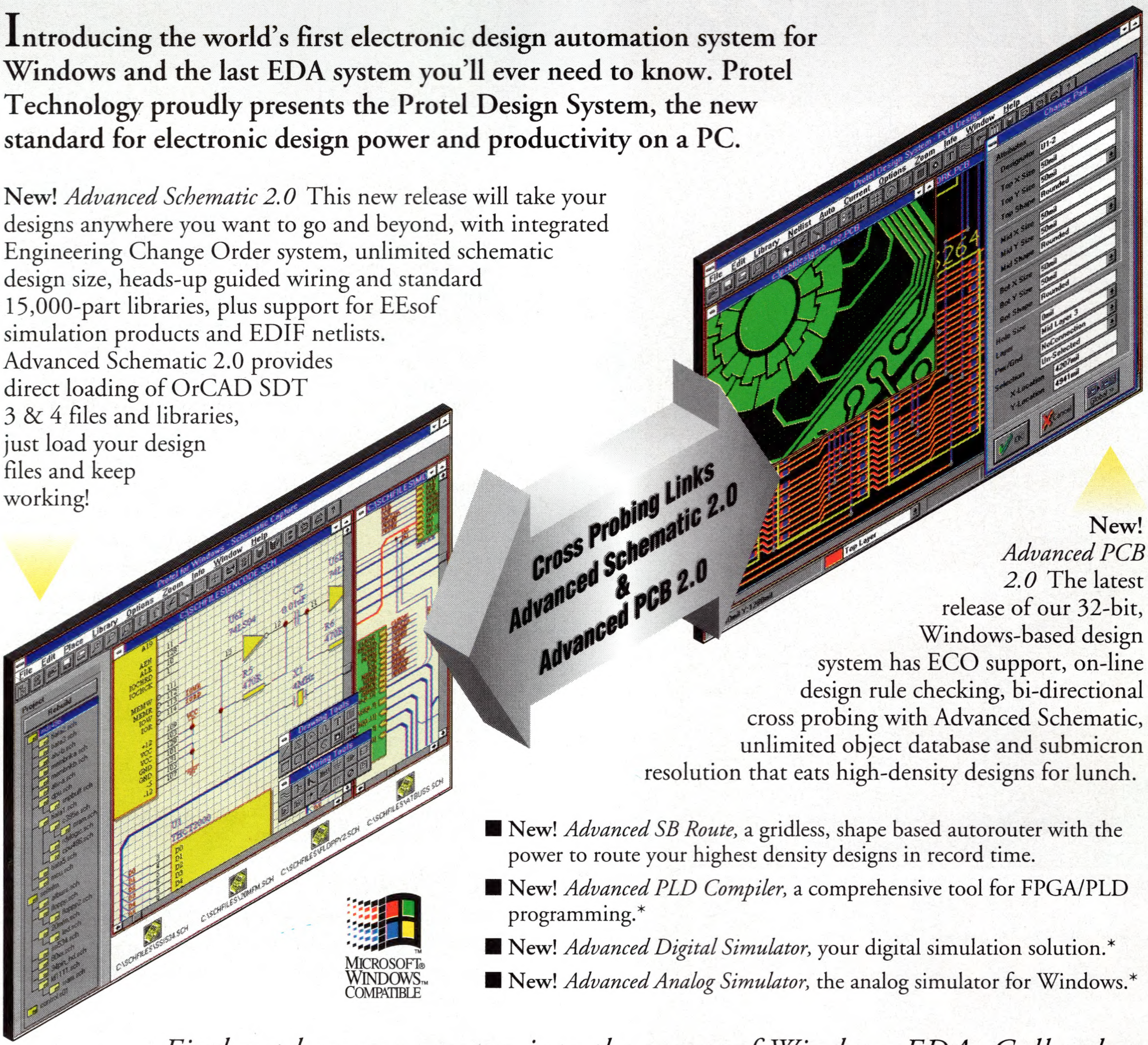

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FROM THE
EDITOR'S DESK

Yes, but no

This month's special feature on manufacturing makes for interesting reading. In his article *Facing up to the green idyll,* AEE's Ross Gow finds out about the latest in environmental standards and how local manufacturers are dealing with the elimination of CFCs, and introducing no clean or aqueous cleaning methods. It seems local electronics manufacturers have taken the standards and requirements in their stride.

Meeting customers' needs is as important as meeting regulations. It is said that Australia will never be a serious contender in the worldwide manufacturing stakes. It certainly won't if a story I heard recently is evidence of prevailing business attitudes.

A Chinese company requested a major Australian manufacturer to supply one million units of a particular product in a special colour, by a certain time. Quite straightforward, given the particular manufacturer's capability and usual production quantities.

And the company's response: According to our production schedules we are not planning to manufacture that type of unit until September (too late) and we can only supply white units (wrong colour).

Needless to say, the Chinese company went elsewhere.

Although the Australian company concerned is not directly involved in the electronics industry, its parent company has associations with it.

The story illustrates an attitude that desperately needs to be avoided if Australia is to be a serious player on the world manufacturing stage. How can we measure the damage such a response has had on Australia's reputation? How many other similar occurrences are helping to ruin the reputation of this nation's ability to do business and be professional?

In the competitive world of manufacturing, old-fashioned production-driven organisations are no longer viable. To succeed in the nineties and beyond, companies must be customer driven.

Somewhere along the line, someone forgot.

Jennifer Liston

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(ACN 008 427 067)
47 Chippen St, Chippendale, NSW 2008
PO Box 815, Strawberry Hills, NSW 2012
Tel: (02) 699 2411
Fax: (02) 698 3920, 319 4487

Editor
Jennifer Liston
Editorial Assistant
Ross Gow
Sub-Editor
Krystyna Wareing
Asian News Source
Asian Electronics Engineer
Trade Media Ltd
NSW Sales Manager
Arthur Whall
Vic Sales Manager
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Product Enquiry
Karin Smith

Victoria 12 Strathalbyn Street, East Kew 3102. Tel: (03) 859 1240 Fax: (03) 859 1316 **South Australia** 12 O'Connell Street, North Adelaide 5006. Tel: (08) 267 1299 Fax: (08) 239 0436 **Queensland** 18 Finchley Street, Milton 4064. PO Box 99, Paddington 4064. Tel: (07) 369 1566 Fax: (07) 369 0280 **Western Australia** Kevin J O'Keeffe, O'Keeffe Media Services, 185 York Street, Subiaco 6008. Tel: (09) 381 7766 Fax: (09) 382 4850 **New Zealand** Mike Bridgman, Bridgman Marketing & Media Ltd, PO Box 991, Auckland. Level 8, 17 Albert Street, Auckland. Tel: (9) 308 9693 or (9) 358 0680 Fax: (9) 358 0570 **United Kingdom** Anthony Turner, The Colin Turner Group, City Cloisters, 188-196 Old Street, London EC1V 9BX, UK. Tel: (71) 490 5551 Fax: (71) 490 2271 **Germany** Mr Friedrich Anacker, InterMedia Partners GmbH, Deutscher Ring 40, 5600 Wuppertal 11 Germany. Tel: (202) 71 1091 Fax: (202) 71 2431 **USA** Roy Diton, Trade Media International Corporation, 1328 Broadway, New York, NY 10001 USA. Tel: (212) 564 3380 Fax: (212) 594 3841 **Hong Kong** Mr C K Kwok, Eastern Source International Media Centre, 4/F., Professional Building, 19-23 Tung Lo Wan Road, Causeway Bay, Hong Kong. Tel: (852) 890 5510 Fax: (852) 895 1443 **Singapore** Associate Media, Blk. 152 Bukit Batok St. 11, #01-258, Singapore 2365, Tel: 65 563 6756/563 6757, Fax: 65 563 6523 **Taiwan** Mr Polo Chang, Business News, PO Box 3-178, Yungho, Taiwan, ROC 23498. Tel: (2) 736 0027 Fax: (2) 738 4822 **Canada** Mr Ed Bush, International Advertising Consultants Ltd, 2 Carlton Street, Suite 1301, Toronto Ont. M5B IJ3. Tel: (416) 977 6269 Fax: (416) 977 6276 **Korea** Mr O-Kyu Park, World Marketing Inc, Dongbo Bldg, 81-9 Nomhyun-Dong, Kangnam-Ku, Seoul, 135-010 Korea. Tel: (822) 511 4944 Fax: (822) 548 8295 **Italy** Mr G Nota, Publicitas Spa, Via Emanuele Filiberto 4, 20149 Milan, Italy. Tel: 39 2 3887-1 Fax: 39 2 342994 **Sweden** Mr Jacques Nyman, Utlandsannon AB, S-106 12 Stockholm, Sweden. Tel: 46 879 66650 Fax: 46 861 33012 **Japan** Mr Haruki Hirayama, EMS Inc, 1-20-3-2F, Matsubara, Setagaya-ka, Tokyo 156, Japan. Tel: 81 3 3327 2688 Fax: 81 3 3327 3010

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AABP

VSI Electronics and Volten align

The Australian agent for Berg connectors, Volten, which also is an emerging cable assembly manufacturer, has reached an agreement with local connectors distributor VSI Electronics to closely bind the companies' service operations. The alliance agreement, signed by VSI managing director Bob Crabbe and Volten general manager Robert Jarvis, will broaden the services available to the companies' customers, VSI said.

Marketing manager for VSI Barry Wilson said the two companies would still operate as separate entities, with the focus of their alliance at sales level. VSI and Volten sales representatives will approach customers as a team, offering a wider range of services.

VSI's Bob Crabbe (left) and Volten's general manager Robert Jarvis.

"We've had an increasing amount of clients ask us to make up cable assemblies," Wilson said. "Until now, any requests like that we've had to handle through sub-contractors. Through the alliance with Volten we will be able to offer clients a total solution to their cabling needs from the outset."

Both VSI and Volten believe the future for distributors in Australia will be in value added services. "Just shifting components around will become less and less profitable, plus there're a lot of people doing it. We're aiming to differentiate ourselves by offering more services," Wilson said.

The signing of the agreement coincided with a move to bigger premises by VSI Electronics, which is now at Unit C, 6–8 Lyon Park Road, North Ryde. The new building has a production facility which Wilson said had been "earmarked for future developments". ☐

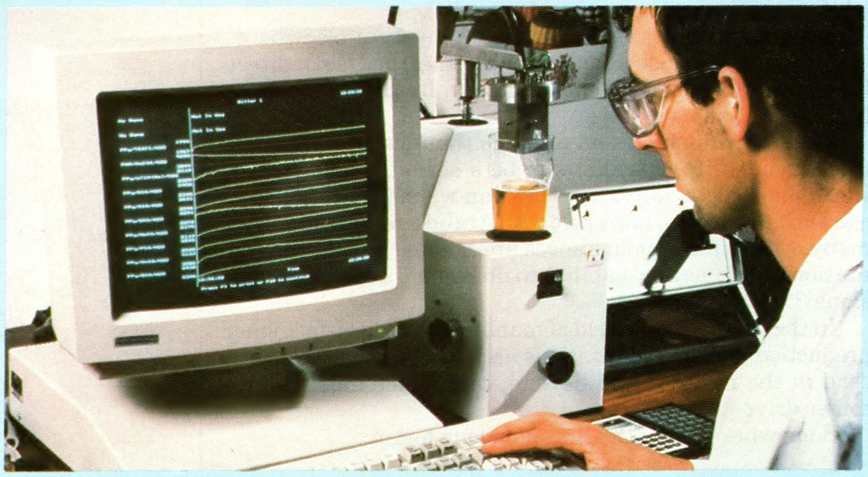
No changes for HarTec, despite new name

Hardie Technologies' recent name change to HarTec will have little effect on the structure of the company, HarTec said.

Business development manager for the company David Crainean explained the name change "stemmed from a decision by former parent company James Hardie Group to float Hardie Technologies as an independent public company.

"Hardie Technologies was always an independent and self sufficient organisation. Everything is operating as it has been, it's only the share-holding that's different," he said.

The company's three divisions have also received new names in line with the recent changes. NSD Australia, suppliers of board level electronics components, is now known as HarTec Components Division; Hardie Networks, network hardware and accessories supplier, is now known as HarTec Networks Division; and LSE Manufacturing, customised manufacturing contractors, is now HarTec Manufacturing Division. ☐


The world's first artificial nose has been developed by Neutronics, a British company based north of London. The Neutronic Olfactory Sensing Equipment (NOSE) can be trained to analyse and detect smells better than the human nose, Neutronics said. The NOSE, comprising 12 sensors capable of registering a distinctive aroma as a unique fingerprint, is a simplified version of a human nose which has about 10,000 sensors. The sensors are made of polymers that conduct electricity. As the sensors absorb the ingredients in aromas, gases and vapour, they bind to the polymer, either impairing or improving its ability to conduct electricity. The conductivity changes can be processed to produce a visual fingerprint that is compared to a previously measured pattern. Manufacturers from a range of industries, including food and drink, perfumery, cosmetics and pharmaceuticals, can use the NOSE to keep a quality check on products, Neutronics said. ☐

Boost to Japan's mobile market: study

A study by global marketing intelligence and forecasting organisation BIS Shrapnel indicates the Japanese mobile market will demonstrate high growth rates over the next decade. Titled *Mobile Communications In Japan*, the report points to strong export opportunities for Australian suppliers.

The study forecasts that the number of mobile telephone users in Japan will increase by 160 per cent to 6 m over the next few years. It also predicts the number of pager users will increase from 7.3 m to 11 m by 1998.

Researcher for BIS Shrapnel Vanessa Makris said this was mainly because of the introduction of digital services throughout Tokyo and prefectures with the launch of two vigorously competitive operators. Deregulation of the equipment market, ambitious coverage plans from both digital and analogue suppliers and the introduction of competitive pricing plans will also play a part in boosting Japan's mobile market.

Mobile Communications In Japan and other BIS Shrapnel studies can be obtained by calling (03) 820 3855, quoting *Australian Electronics Engineering.* ☐

Mechatronics 'tryout' for Skill Olympics

Work Skill Australia's Mechatronics competition drew 60 competitors from high schools, TAFE colleges and the industry to the AIEE '94 exhibition at Darling Harbour last month. Entrants used their skills in electronics, mechanics, hydraulics and pneumatics to try and win a place on Australia's Skill Olympics team.

Mechatronics was introduced as a new category at the 1993 Skill Olympics in Taiwan. Competitors are provided with identical material and must complete the same tasks in eight hours. Projects are judged progressively by a panel of experts according to a prescribed marking system.

State Rail Authority employee Heath Griffin and Jason Press (self employed) this year picked up the gold medal for the Sydney region. Silver went to Comalco Rolled Products employees Daniel Smith and Peter Whyte (pictured). Paul Sheehan and Trent Billet from Alcan picked up a bronze medal.

The national winners will represent Australia at the 33rd International Youth Skill Olympics to be held next year in Lyon, France. □

Rohde & Schwarz wins CAA contract

Rohde & Schwarz Australia has received an order from the Civil Aviation Authority to supply 10 SMT RF signal generators. The contract is said to be worth about $200,000 to the company.

The signal generators are to be stationed at each of Australia's major airports. They will be used to check, maintain and align beacon monitoring equipment vital to the effective running of the localiser and glide path components of each airport's instrument landing system. The instrument landing system is necessary to guide pilots onto a runway in low visibility conditions.

The order for 10 SMT signal generators follows the recent awarding of another CAA contract to Rohde & Schwarz for 8 SMHU signal generators, to be used for primary radar testing and maintenance. □

LATELINES

Philips is holding an 80C51 design contest in conjunction with the release of its DS-750 microcontroller development tool. Contact Arlec Technical Products in all states for entry forms, quoting *Australian Electronics Engineering.* □

Alcatel has employed more than 100 engineers to expand its System 12 digital exchange R&D groups following its contract as major switching supplier to Telecom Australia. □

It's official! Over the period 1982 to 1992, Western Australia was Australia's fastest growing State, says a report from the Bureau of Industry Economics. The State expanded its economy by 53 per cent compared with the national average of 26 per cent. WA manufacturers boosted their output by 20 per cent when the national average was 3 per cent, and the State exported 40 per cent of its total output. □

Hewlett-Packard and Intel have announced a joint R&D project to provide advanced technologies for workstation, server and enterprise-computing products. The companies' efforts will encompass 64-bit microprocessor designs, advanced semiconductor processes and software optimisation. □

Australians can now access the French Minitel system from their own computers. For more information contact Minitelnet Australia in Box Hill, Vic, tel (03) 808 7091, fax (03) 808 4983, quoting *Australian Electronics Engineering.* □

Eden Technology has moved to larger premises. Its new address is Level 10, 1 York Street, Sydney NSW 2000, tel (02) 241 3122, fax (02) 241 3988. □

The arrival of pay-TV has drawn attention to the shortage of skilled pay-TV satellite dish installers in Australia. To counteract the problem, the Australian Antenna Technicians Association has introduced a training course at Moorabbin College of TAFE for anyone interested in providing such a service. The course is for those who have antenna installation skills or a knowledge of electronics and can be undertaken in two full days or across three weekly Thursday night sessions. Further details from Moorabbin College of TAFE, (03) 556 9760 quoting *Australian Electronics Engineering.* □

Eaton Electrical Components has relocated its Arrow Hart switch manufacturing facility from Auckland, New Zealand to Somerton, Vic. Eaton's Arrow Hart product manager Steve Nelson said the move would bring all manufacturing, product development and service activities closer to the company's original equipment manufacturer customers. The new complex will employ over 180 people. The address is 208 Hume Highway, Somerton Vic 3062, tel (03) 217 3477, fax (03) 217 3489. □

German quartz manufacturer Telequarz Group is looking for an Australian representative for its range of quartz crystals, crystal oscillators and crystal filters. For further information contact Tele Quartz GmbH, Landstrafle, D-74924 Neckarbischofsheim, Germany, tel 0011 49 7268 8010, fax 0011 49 7268 1435 quoting *Australian Electronics Engineering.* □

RC/5 is a new committee formed to promote standardisation in radiocommunications, broadcasting and signal distribution components and infrastructure. RC/5 will focus on equipment and system specifications, performance measurements, test methods, safety and location of facilities. Subcommittees of RC/5 have also been established to monitor and contribute to the work of international technical committees engaged in various areas of telecommunications. Anyone who wants to be involved should contact Scott Meynert, tel (02) 746 4834, fax (02) 746 4785, quoting *Australian Electronics Engineering.* □

A Queensland consortium has been awarded a two-year contract to track and defeat security breaches of the Australian Academic and Research computer network (AARNet). The Australian Computer Emergency Response Team (AUSCERT) will provide security advice service through the University of Queensland, Griffith University and Queensland University of Technology. □

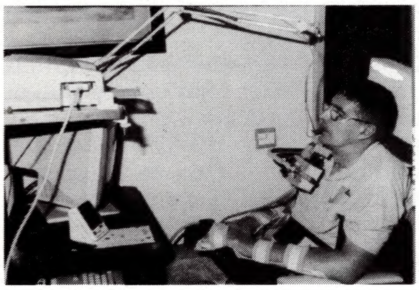
Awards honour export power of business alliances

The inaugural presentation of Southern Cross Awards in Brisbane recently saw 18 Australian companies receive recognition for successful involvement in the Federal Government's Partnership for Development scheme. The scheme has been particularly successful in the IT industry, where international companies and their local alliance partners now account for over half of Australia's IT exports.

The awards were presented by the Technology in Government Committee, with Bob Charles MP, member of the Parliamentary Standing Committee on Industry, Science and Technology, and Ian Reinecke, chairman of the Queensland Information Policy Board, handing over awards to companies involved in partnerships that had contributed to Australian industry and export markets.

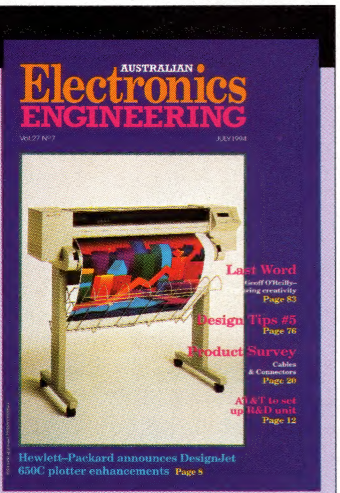
Companies to receive awards were Armdec, Aspect Computing, Datacraft Technologies, ERG, ERM, Exicom, HarTec, Hypertec, Intellect, Keycorp, Mincom, MM Cables, Moldflow, NetComm, QPSX Communications, Stallion Technologies, Utilux and Webster & Associates.

In 1995, international IT companies and their local alliance partners would account for about $1.5 bn in exports for Australia, the Committee said. ☐



Technical Aid To The Disabled (TAD) is a voluntary organisation dedicated to designing and making aids for people with disabilities when such aids are unavailable commercially. Bill Thomas (pictured), a sufferer of multiple sclerosis, is deprived of speech and only able to move his head and jaw. Thanks to a TAD volunteer, he now communicates through an ordinary computer he operates with a bite switch that had been designed to suit his needs. TAD urgently needs engineers and other professionals who would value the personal reward of solving individual problems for people with disabilities. Interested technical people with access to a workshop can become involved by calling the TAD branch in their State. Phone New South Wales (02) 808 2022; ACT (06) 285 4040; Northern Territory (089) 81 1877; Queensland (07) 397 7055; Victoria (03) 254 5625; South Australia (08) 261 2922; Tasmania (002) 78 2758 and Western Australia (09) 221 1406. ☐

ON THIS MONTH'S COVER



Hewlett-Packard, worldwide leader in large format plotter sales, has announced enhancements to its popular HP DesignJet 650C colour inkjet plotter.

The plotter, which provides 300 dpi colour and addressable 600 dpi monochrome output, is ideal for CAD users who work in small groups of four to 10 people on standalone computers or in networked environments.

The standard 4 MB of memory is expandable up to 68 MB. There is a faster release 12 AutoCAD driver which cuts screen lockout time by as much as 40 per cent. An enhanced Windows 3.1 driver allow automatic scaling and includes HP's new technology ColorSmart, which automatically optimises colour output and provides clear and vivid colours. The plotter automatically switches among PostScript and other languages. [386] (22)

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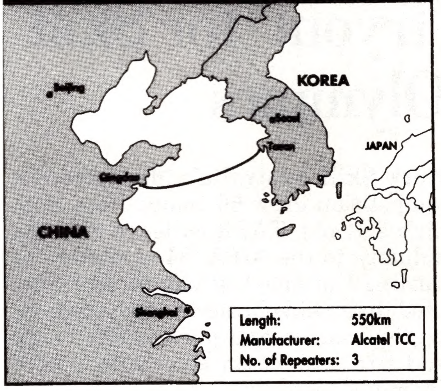
China-Korea
Submarine Cable System (CKC)



Alcatel TCC wins China/Korea cable contract

Alcatel TCC has won an export order to supply a turnkey optical fibre undersea cable system that will link China to Korea.

The contract for the China-Korea submarine cable system (CKC), said to be valued at $48 m, was awarded by the Directorate General of Telecommunications, part of China's Ministry of Posts and Telecommunications, and Korea Telecom.

The 550 km link from Qingdao in China's Shandong province to Taean in Korea, south of Seoul, will operate at 560 Mb/s over two fibre pairs. The length of cable will be manufactured at Alcatel TCC's Port Botany site. Three optical repeaters, required to maintain signal flow across the link, will be manufactured under 'clean room' conditions at Alcatel's Liverpool facility.

The heavily armoured cable and three repeaters will be deeply buried in the ocean floor to avoid damage from the many fishing trawlers that operate in the Yellow Sea between China and Korea. The cable link is scheduled to begin service in November next year. ☐

Intel Aust teams with Telecom

Telecom and Intel Australia have signed a Memorandum of Understanding, which is the basis for future joint developments by the two companies in audio, data and video desktop applications.

The agreement was signed recently by Telecom's portfolio manger, Telemedia, Martin Turner, and Intel International's senior vice president of Corporate Strategy, David House, who was in

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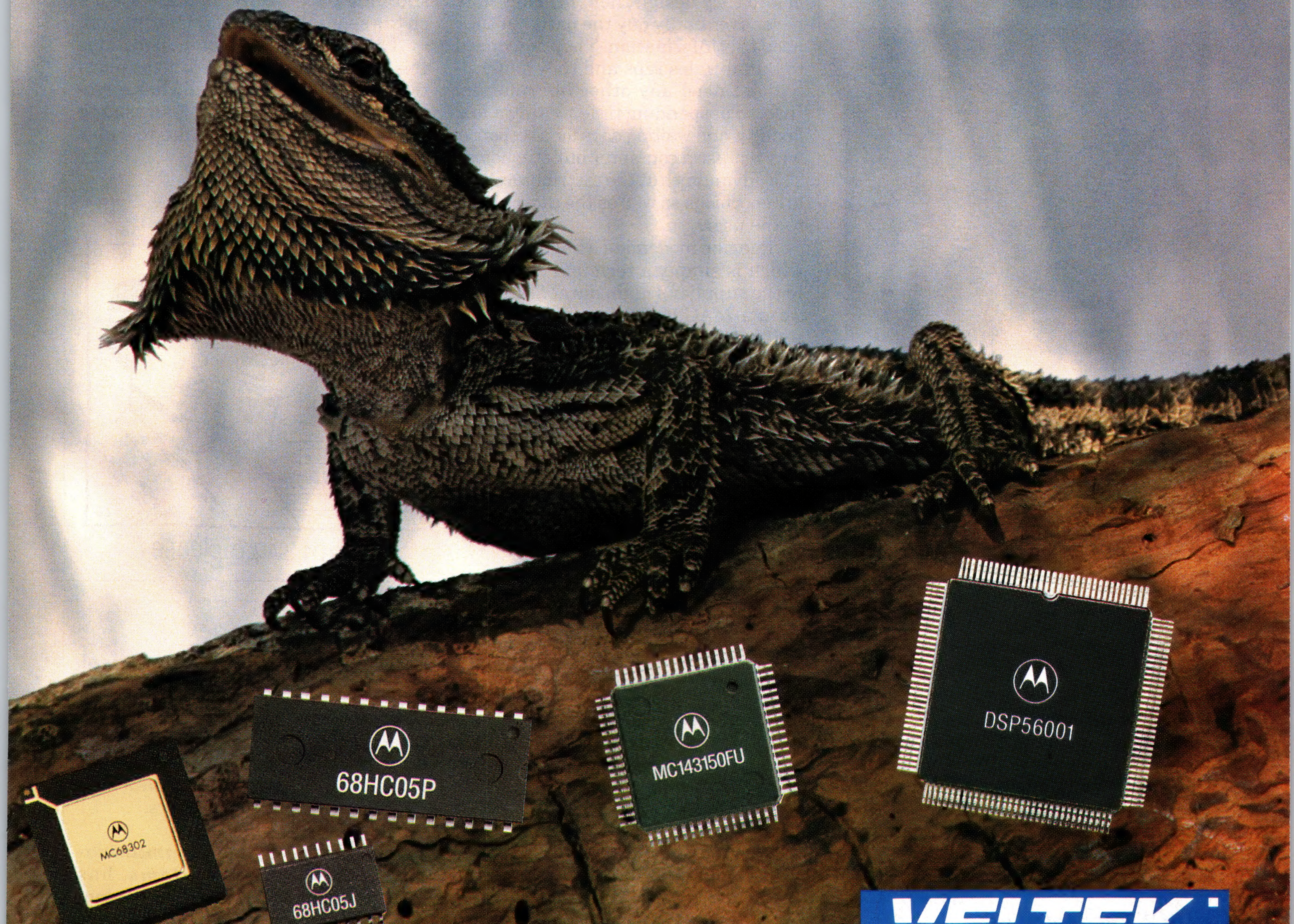

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Australia to help promote Intel's range of pentium processors.

Telecom and Intel will work jointly on desktop conferencing applications which can be accessed by customers using modems, LANs, the public switched network or the integrated services digital network (ISDN).

Turner said, "As the sectors of telecommunications and computing move closer together, we see cooperative undertakings such as this one with Intel as the way to get the best out of our shared interests and separate strengths."

Turner added that through their alliance, Telecom and Intel had the technologies which would allow computers and telephone services to be tailored to meet individual customer needs. "The market potential for desktop communications in this environment is quite astounding," he said. ☐

Martin Turner, Telecom's portfolio manager, Telemedia, and David House, Intel's senior vice president of corporate strategy, sign a Memorandum of Understanding.

LETTERS

Do you sometimes wish...?

Editor

I've recently been pricing parts for a project I'm developing and I'm surprised at how long it can take and the effort required to get a response from suppliers. This isn't necessarily because they're bad suppliers. It might just be because they're overloaded diverting resources to activities that won't necessarily bring them a financial return.

I thought there must be a better way.

Most project developers want to know price and availability of parts before they design them in. They may never eventually buy the part, but they need this information. They don't need to talk to sales reps and they generally don't need any other information. Instead of spending time writing a fax, faxing it and waiting days for a response, why not use a computer bulletin board. The advantages at the distributors' end are enormous as well as the convenience to the user.

Imagine modeming a bulletin board, which is simply a terminal connected to the supplier's main database. If you want a 74AC04 just type it in and you see the prices for various quantities, availability, manufacturer plus anything of relevance on your computer screen.

Perhaps a smarter distributor would include an option to make a credit/debit card purchase of the parts on the spot or place an order. The data would always be current.

Any news a distributor might want to pass on to customers could be included, including specials or clearouts. If the customer requires more information, they can leave a message and be contacted later. No doubt many customers would check other parts they hadn't considered using.

Many suppliers can provide you with a hard copy of their stock list and prices upon request. Of course they're out of date as they're being printed and paper is wasted. Sales reps would now be free to do what they do best, spend beneficial time with customers rather than shuffling paper. Sure, in one way, it's on the spot self service for information.

The information revolution dictates this will happen. But when, is the question. If any supplier already has a system like this operational, I and many others would definitely like to know about it. ☐

Peter Baxter
Cochlear

... with sauce please!

DISTRIBUTOR NEWS

GEC Electronics Division has been appointed sole Australian and New Zealand distributor for **Atmel.** Atmel supplies Flash, EPROM, EEPROM PLDs and FPGAs. ☐

DICE Technologies has been appointed distributor for **Teltone Corporation.** Teltone's products include telecom interface components, telco signalling products, line sharing systems and custom designed solutions. ☐

DCS Australasia has been appointed distributor for **Mylex** of the US. ☐

Kingston Technology, manufacturer of processor, memory, storage and networking upgrades for PCs, workstations and laser printers, has appointed **NJS Technology** joint distributor of its products in Australia. ☐

Rohde & Schwarz has signed a distribution agreement with Japanese instrument supplier **Advantest Corporation.** ☐

Compact Software has appointed **Step Electronics** as its distributor. Compact Software products include schematic capture, linear simulation, non-linear simulation, electro-optical simulation, physical layout, system simulation, time domain simulation and full-wave EM simulation tools. ☐

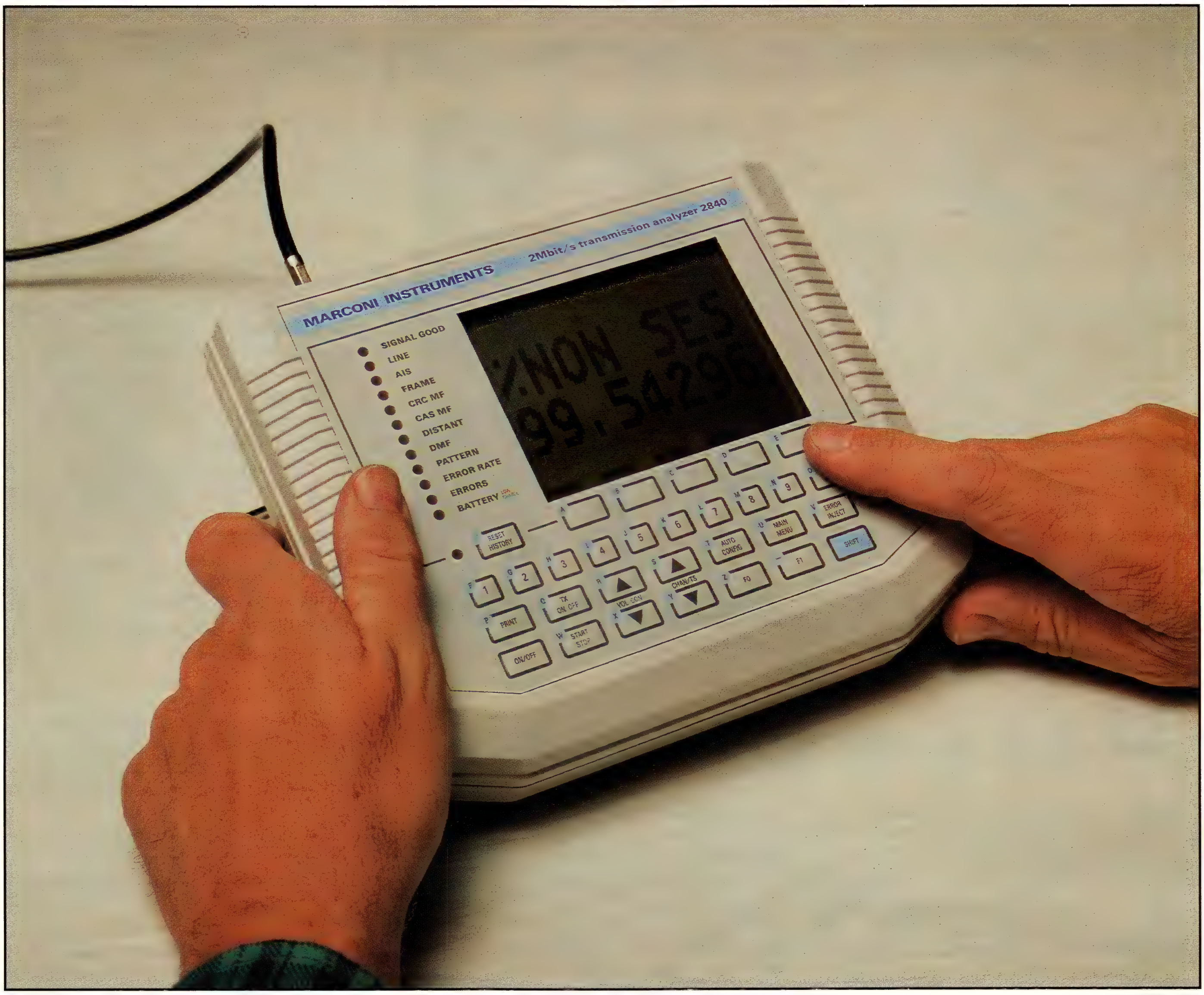
Astro-Med of the US has appointed **Metromatics** as its sole distributor in Australia and New Zealand for its range of data capture recorders. ☐

Scitec Communication Systems has signed a memorandum of understanding with Canadian company **Calian Technology.** Calian will sell Scitec's packet bandwidth manager range. ☐

Hand Held

Digital Transmission Analyzer 2840

NEW



- ☐ Handheld Pattern Generator and Error Detector
- ☐ Framed and Unframed Operation at 2048 kbit/s
- ☐ nx64 kbit/s Testing, Contiguous and Non-Contiguous, including Drop and Insert
- ☐ G.821 Analysis
- ☐ Histograms for Error Distribution and Alarms
- ☐ Print to RAM for up to 10,000 Events
- ☐ Multiple Tests Storage for up to 10 Full Sets of Results
- ☐ Output Level Attenuation for Margin testing
- ☐ Digital Signal Frequency and Level Measurement
- ☐ Channel Associated Signalling Measurements
- ☐ Propagation Delay Measurement
- ☐ Alarm Condition Simulation and Detection
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Concurrent engineering at SM '94

The Surface Mount and Circuit Board Association (SMCBA) has confirmed Hewlett Packard's John Meredith will be a guest speaker at the Surface Mount '94 conference to be held in Melbourne in October. Meredith, product development project manager for Hewlett-Packard's Greely facility in the US, will give a presentation called *The Implementation Of Concurrent Engineering.*

Meredith will look at the issues concerning concurrent engineering including team building, the importance of commitment at all levels, the refining of a vision through the inputs of all stake-holders and how to manage the unforeseen events that shape results. He will draw upon his personal experiences with concurrent engineering, using a recent product development program implemented by the Optical Storage Division of Hewlett-Packard as a case study.

Other speakers confirmed for SM '94 include Steven Wong from Alpha Metals in Singapore and Mark Peo from US-based Heller Industries, both of whom will look at recent advances in soldering technology.

John Meredith of Hewlett-Packard

George Edwards from Morris Productions, Keith Torpy from Email Westinghouse and Geoff Griffiths from Precision Circuits will give an Australian perspective by hosting a forum session on design and manufacturing. And Gary Ferrari and Dieter Bergman, two representatives from the Institute for Interconnecting and Packaging Electronics Circuits (IPC), will host a workshop on land pattern design. Ferrari and Bergman were responsible for the IPC publication, *Advanced Principles of Land Pattern Design for Printed Circuit Board Manufacture, Assembly and Test.*

Surface Mount '94 will be held in conjunction with the Elenex Exhibition from October 18 to 21. Further information from Diane Hunt at the SMCBA, tel (03) 569 6393, fax (03) 569 1047, quoting *Australian Electronics Engineering*.. □

AT&T to set up R&D unit

AT&T Australia has announced plans to establish a research and development facility in Australia. The $3.5 m facility initially will employ 10 people and will share a global mandate with a US-based team for the development of systems management software for premises based multimedia and messaging systems.

The research facility announcement was made recently by Tim Wilson, managing director of AT&T Global Business Communications Systems (GBCS). "Australia is uniquely placed as it offers world class expertise in the field of multimedia software development," Wilson said. Pointing to the advantage offered by Australia's multicultural background, he added, "our intention is to recruit a team which can combine its technical and language skills to develop export products".

AT&T GBCS conducts R&D in Australia using third party software developers who meet the needs of local customers. Continuing growth has created a demand for a more formalised research development facility, AT&T said. The local facility will complement the existing third party software development activities.

"With AT&T GBCS operating in over 75 countries, the export potential for the products developed is quite significant," Wilson said.

The research facility announcement coincided with an announcement by Optus Communications that it had selected AT&T Australia as its preferred supplier of switches for the Optus mobile digital service. Optus will buy AT&T 5ESS switches for the next rollout stage of its digital network. □

Telecommuter boom: report

The report, *Telecommuting Australia — A Business and Market Analysis,* predicts one in four Australians will telecommute by early next century.

Written and researched by consultancy firm Goanna Communications, the report analyses available data to produce three scenarios for the future of telecommuting growth: low, medium and high. Under the high growth scenario the report predicts over 2 m people could be telecommuting by 2005. Over 250,000 Australians have already replaced commuting with telecommunications options.

Technical director of Goanna Communications John McNaull said, "telecommuting represents a major market for vendors of IT products and services, particularly intelligent networks, ISDNs, remote LAN access, workgroup software and videoconferencing".

He also warned sustained growth in telecommuting would depend on the rate at which Australian employers could retrain managers to operate in a new workplace environment. "Despite being a key enabling factor, technology capability and cost will not on their own be able to fulfil expectations and potential," he said.

The report is available from Stuart Corner Information Services, tel (02) 555 7377 quoting *Australian Electronics Engineering.* □

Here at *Australian Electronics Engineering* we welcome letters from you, the readers, about anything related to the electronics industry.

If you would like to share an opinion with your fellow electronics engineers, why not drop us a line?

Address your letters to the Editor, PO Box 815, Strawberry Hills NSW 2012. Feel free to contact the Editor any time on (02) 318 3860.

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OMEGA 8040

US interconnection industry association, the Institute For Interconnecting and Packing Electronic Circuits (IPC), has established a research institute to develop advanced technology for printed wiring boards (PWB) and PWB assemblies. The Interconnect Technology Research Institute (IRTI), to be initially based in Austin, Texas, will provide a vehicle for collaboration among the electronic interconnection industry, government and academia. IPC said it would allow companies and the government to leverage their research and development investment in a way that ensures the participation of the entire supply chain necessary to advanced PWB production. □

The Association of European Accumulator Manufacturers (Eurobat) has prepared a guide to assist battery specifiers and purchasers with the classification of sealed, valve regulated (VR) lead acid batteries. The guide provides a common standard to develop purchasing specifications by breaking up the range of VR stationery cell applications into four major groups: high integrity, high performance, general purpose and standard commercial. These groups, each with its own set of tabulated performance suggestions, can be used to position a particular product according to its intended application, its claimed performance and lifespan characteristics. Copies of the Eurobat Guide are available from Battery Energy South Pacific, phone (02) 681 3633. Quote *Australian Electronics Engineering.* □

VME Systems has moved to larger premises. The new address is 26 Harker St, Burwood, Victoria 3125, tel (03) 888 8211, fax (03) 888 8371. □

Hayes Microcomputer Products Australia has reduced its prices of its range of Smartmodem OPTIMA data and fax modem products. The Optima 288V.FC + fax now retails for $1055, the Optima 144 + fax144 for $630 and the Optima 96 + fax96 for $425 (all prices include tax). The price cuts represent a reduction of up to 50 per cent on these products, Hayes said. □

Duet Electronics has relocated to 403 Victoria Street, West Brunswick, Vic 3056. The move to larger premises involves a new phone and fax number: (03) 380 6454 and (03) 380 8766, respectively. □

The Bell-MEM and Warburton-Franki divisions of Bell-IRH Industries in Brisbane have moved to larger premises. The two Brisbane divisions are now at 42-44 Manilla Street, East Brisbane, Queensland 4169. Telephone and fax numbers are unchanged. The move follows the expansion of Bell-IRH's divisions in Melbourne which also involved the relocation of the company's facilities. The Victorian branches of Bell-MEM, IRH Components and Warburton Franki are now at 140 Burwood Hwy, Burwood, Victoria 3125. The new phone numbers are: Bell-MEM (03) 888 8100, IRH Components (03) 888 8010 and Warburton Franki (03) 888 0250. The fax number for all three is (03) 888 0280. Although Bell-IRH's corporate headquarters in Sydney has not moved, it too has a new address, through Australia Post's re-designation of borders. The Sydney office is now at 1-5 Carter Street, Silverwater NSW 2128. The new mailing address for Sydney is Locked Bag 103, Silverwater, NSW 2128. □

Victorian based DCI Technology has established an electronic engineering support unit. The unit will provide R&D support in the areas of hardware and software design, debugging, testing to standards, and technical documentation. The company employs two engineers, a technical officer, an electronics technician and several CAD operators. □

The Secretariat of the Australian Science and Technology Council (ASTEC) has moved to ASTEC Branch, Office of the Chief Scientist, Department of the Prime Minister and Cabinet, 3–5 National Circuit, Barton ACT 2600, tel (06) 271 5111 or (06) 271 5084, fax (06) 271 5125 or (06) 271 5127, email: rdnet@astec.gov.au. □

Warning for Aust at AIMTEC '94

The 1994 Australasian Instrumentation, Measurement, Test and Evaluation Conference held recently in Adelaide drew local industry and government test agency people, as well as international representatives from the US and Europe.

AIMTEC '94, the first of its kind to be held in the Southern Hemisphere, gave a regional perspective to issues such as the importance of test and evaluation, making the most of R&D investments, and the potential for test-sharing to defray the costs of testing complex systems. There was also a call to institutionalise test and evaluation methods in Australia, based on the US system.

Among conference speakers was former US astronaut and NASA administrator Admiral Richard Truly, whose presentation included a warning that Australia required appropriate test and evaluation processes to improve the performance of products and staff safety.

"When products and systems are not tested and evaluated appropriately, those who developed the products and systems can be faced with making expensive modifications. In some instances, disasters may even occur," Truly said.

He also spoke of the cost-saving advantages effective testing can produce. Using the University of South Australia's Australian Centre for Test and Evaluation as an example, he also pointed to the advantages of multi-purpose test centres. □

Tas NWC teams-up with Canada

Tasmania's North West Communications (NWC) has established a joint venture with Canadian company Mine Radio Systems (MRS) to produce in Australia the MRS Flexcom underground radio system. The new company that stems from the alliance will be known as Mine Radio Systems Australia (MRSA).

The Flexcom system that will be produced by MRSA provides up to 16 channels of voice and/or data as well as two video channels over a single 'leaky' feeder cable.

Applications for the system include cage control, slack rope detection, skip weight measurement, ventilation control, pump control, vehicle status and location, employee key tagging system, closed circuit television and remote control of machinery. □

SuperDRIVER

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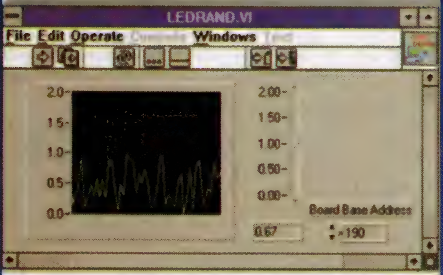
for VMEbus, STEbus and PCbus Hardware

Step 1

Choose a Windows Application . . .



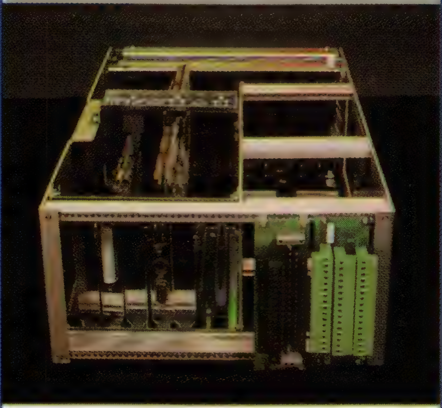
0.67

Board Base Address
x190

Choose
the Windows program
that suits the application

Step 2

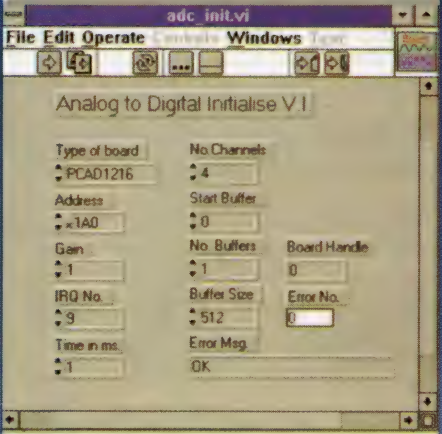
. . . Choose the hardware . . .



Plug together
the PC-compatible CPU
and I/O boards

Step 3

. . . Select a SuperDRIVER
and configure the system



Analog to Digital Initialise V.I

Type of board: PCA01216
Address: x1A0
Gain: 1
IRQ No.: 9
Time in ms.: 1
No.Channels: 4
Start Buffer: 0
No. Buffers: 1
Buffer Size: 512
Error Msg.: OK
Board Handle: 0
Error No.: 0

Set up
the system via Windows.
Configure low-level I/O detail

SuperDRIVER software from Arcom Control Systems provides a powerful graphical approach to I/O configuration and optimisation which simplifies custom computer systems projects on VMEbus, STEbus and PCbus. SuperDRIVER interfaces have been integrated with a number of popular high level programs, including Visual BASIC™*, Visual 'C'™* and LabVIEW™* SuperDRIVER enables instant setup and reduces system building and configuration time.

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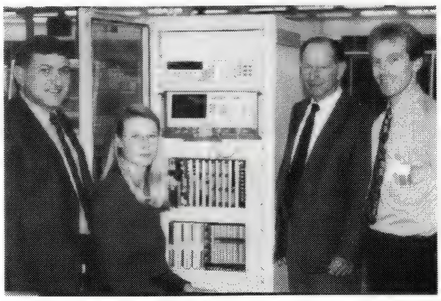
IN BRIEF

A UK judge has ruled that an electronic circuit schematic is a literary work for copyright purposes, and making a netlist from a schematic to generate a PCB is infringement of that copyright, said a report in *Electronics.* Hearing a case of alleged copyright infringement, Justice Jacob said an electronic schematic diagram was not only an artistic work but because of the information written on it, was also a literary work. ☐

Present levels of recycling of electrical and electronic equipment are low because they are not designed with recycling in mind. A report from UK research company Era Technology, titled *Survey on the Implications for Recycling Electronic and Electrical Equipment* says procedures for the development and manufacture of such equipment need to be reviewed to allow for material reclamation and cost effective recycling. ☐

The electronics manufacturing services industry/ contract assembly market grew by about 20 per cent last year, says a report from the Institute for Interconnecting and Packaging Electronic Circuits (IPC). The report, titled *The 1992-1993 market for Electronics Manufacturing Services Providers,* predicts the industry will continue to experience double digit growth until 2000. ☐

HP updates on-site calibration



Hewlett-Packard Australia is offering a new approach to routine calibration of test and measurement instrumentation. The on-site calibration method has been adopted under contract by Ericsson Australia at its Broadmeadows headquarters in Melbourne, where down time has been cut, from four days to less than a day in some manufacturing areas.

Under the contract arrangement, a mobile test laboratory is brought on site and, during an intensive week, both Hewlett-Packard and non Hewlett-Packard instruments are removed from service and calibrated by technicians working at Broadmeadows. The contract also includes preventative maintenance, such as inspection, cleaning, alignment, lubrication and testing.

HP customer service engineer for the Ericsson site, Jon Danks, said the contract was a first for the company in Australia, although the strategy had been successfully implemented in Canada and the US. "We duplicated the test stations (at HP's Blackburn office) in the form of mobile test facilities which we can wheel in, keep on site for a week and then wheel out again. Basically we provide the calibration equipment on site, plus the services of engineers with skills relating to the various items of equipment under test," Danks said.

Ericsson's electronics maintenance manager Graham Blackeby said, "In the past, these particular instruments have been sent out for their annual calibration. Not only has this meant lost days but it also requires extensive paperwork and organisation. Under the HP contract, the equipment is off line for no more than a day, in some cases for as little as two hours." ☐

Optical fibre link for Tas

Telecom Australia has announced a $30 m plan to lay an optical fibre cable under Bass Strait, forming part of a communications link between Hobart, Launceston and Melbourne. The project, announced jointly by Telecom CEO Frank Blount and Tasmanian Premier Ray Groom, is part of the company's five year, $286 m capital investment program for Tasmania.

The Hobart–Launceston–Melbourne link will run for 240 km underwater between Boat Harbour near Burnie on Tasmania's north coast and Waratah Bay near Wilson's Promontory. Early survey work has revealed suitable burial conditions for the cable, which will run 0.6 m under the seabed.

The new link can supply a range of business and domestic services including telecommuting, distance education and, eventually, videophone. Telecom expects the link will be available for service as early as July of next year with construction beginning this month. ☐

ON THE MOVE

Siemens has appointed **Ben Ho** Victorian and Tasmanian marketing manager. Ho will look for new markets for Siemens' range of Simatic PLCs. ☐

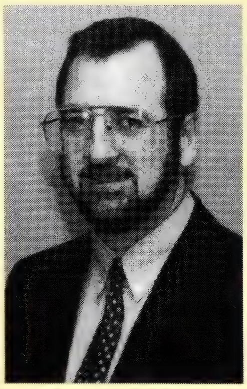
Glen Parkinson has been elected president of the Institution of Engineers in South Australia. He replaces Australian Submarine Corporation corporate affairs manager **Ross Milton**. ☐

Andrew Turnbull has been appointed chairman of GEC Alsthom Australia. Turnbull has been chief executive of Burns, Philp & Company since 1984. ☐

BIS Shrapnel has appointed **Michael Nugent** director of information technology, Asia Pacific and general manager, Melbourne office. He will be responsible for BIS Shrapnel's business in Australia and the Asia Pacific Rim. ☐

IDC Australia has appointed **Peter Hind** consultant in charge of its Information Technology Evaluation Program (InTEP). Hind has been involved in the computer industry since 1979. ☐

Arlec Holdings has appointed **Peter Angus** marketing manager of its technical products division and product manager for NEC Components. **Judy Mitchell** has been appointed product manager for the Philips range of ICs and discretes. ☐



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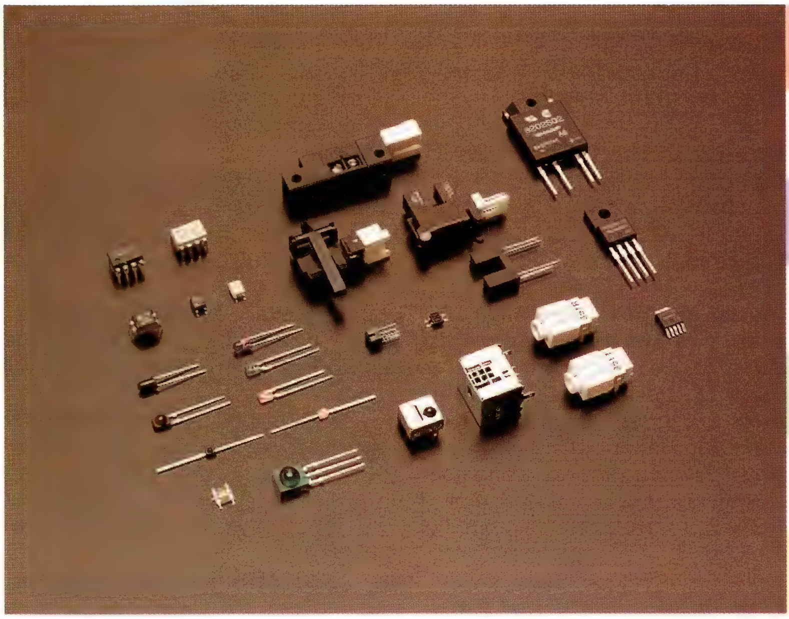

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International Telecommunications Society 10th International Conference, Beyond Competition, *July 3–6,* Sydney Convention Centre. Contact: Donald Lamberton, ITS '94, Urban Research Program, Research School of Social Sciences, ANU, Canberra ACT 0200, fax (06)249 0312. ☐

Multimedia Engineering Education Conference, *July 6–8,* Melbourne University. Contact: Peter Betts, tel (03) 775 2927, fax (03) 776 8821. ☐

Quality in the Community III conference, *July 11–12,* Novotel Northbeach, Wollongong. Contact: Amanda Dawson, AQC, tel (02) 901 9999, fax (02) 906 3286. ☐

Management Problems of the Technical Person in a Leadership Role, *July 11,* Brisbane, ***July 13,*** Sydney, ***July 15,*** Perth, ***July 18,*** Melbourne, ***July 20,*** Adelaide, ***July 22,*** Sydney, ***July 25,*** Hobart, ***July 27,*** Melbourne, ***July 28,*** Canberra. Contact: Pryor Resources, Locked Bag 5, Parramatta NSW 2114, tel 1 800 12 5385, fax 1 800 12 5385. ☐

Introduction to Optical Fibre Technology, *July 12–14,* University of Sydney. Contact: Manager, education & training, University of Sydney, tel (02) 335 0931, fax (02) 335 0910. ☐

Applications of Voice Processing to Telecommunications, presented by Dr Lawrence R Rabiner, *July 13,* University of Technology Sydney. Contact: Anil Kumar, tel (02) 330 2348,, fax (02) 330 2435, or Branka Vucetic, tel (02) 692 3415. ☐

Telemetry & Data Acquisition Systems for Industry, *August 4,5,* Darwin, ***August 8, 9,*** Brisbane, ***August 18, 19,*** Melbourne, ***August 22, 23,*** Hobart, ***August 25, 26,*** Adelaide, ***August 29, 30,*** Perth. Contact: IDC, PO Box 1750, North Sydney NSW 2060, tel (02) 957 2706, fax (02) 955 4468. ☐

GSM Profiting from digital mobile communications, *August 16, 17.* Hyatt Kingsgate Hotel, Sydney. Contact: IIR Conferences, PO Box 2133, North Sydney NSW 2059, tel (02) 954 5844, fax (02) 959 4684. ☐

Music & Entertainment New Technology, Media & Business Affairs, *September 3–4,* Sydney. Contact: Phil Tripp, Immedia!, tel (02) 212 6677. ☐

Satellite Communications, Ninth National Space Engineering Symposium, *September 5–7,* University of NSW. Contact: The Convention Manager, AE Conventions, PO Box E181, Queen Victoria Terrace ACT 2600, tel (06) 270 6520, fax (06) 273 2918. ☐

Communications Research Forum, *September 26, 27,* Hyatt Kingsgate, Sydney. Contact: Vickie Richardson, tel (06) 274 6846, fax (06) 274 6816. ☐

Automatic Data Capture (ADC) show, *October 18–19,* Royal Exhibition Building, Melbourne. Contact: Robyn Short, tel (02) 358 4069, or Laraine Gray tel (02) 958 1811. ☐

Elenex, *October 18–21,* Melbourne. Contact: Noel Gray, Australian Exhibition Services, tel (03) 867 4500, fax (03) 867 7981. ☐

Surface Mount 94, *October 18–21,* Melbourne. Contact: Dianne Hunt, SMCBA, tel (03) 569 6393, fax (03) 569 1047. ☐

Ozchi 94, *November 28–December 1,* Melbourne. Contact: Convention Associates, 13 Jeffrey Street, Mount Waverley Vic 3149, tel (03) 887 8003, fax (03) 819 0823, e-mail: ozchi94@swin.oz.au. ☐

ANZIIS, Second Australian and New Zealand Conference on Intelligent Information Systems, *November 29–December 2,* Brisbane. Contact: ANZIIS 94 secretariat, School of Computing Science, Queensland University of Technology, GPO Box 2434, Brisbane Qld 4001, tel (07) 864 2925, fax (07) 864 1801, e-mail: anziis94@qut.edu.au. ☐

ACOFT 94, 19th Australian Conference on Optical Fibre Technology, *December 4–7,* Melbourne. Contact: IREE, PO Box 79, Edgecliff NSW 2027, tel (02) 327 4822, fax (02) 362 3229. ☐

ATNAC 94, Incorporating multi-media communications, applications & technology workshop, Australian broadband switching & services symposium, and Australian teletraffic research seminar, ***December 5–7,*** Melbourne. Contact: Margaret Keegel, conference manager, tel (03) 903 2808, fax (03) 903 2805, email: mkeegel@monu6.cc.monash.edu.au. ☐

OVERSEAS

Australia Today '94, *June 29–July 2,* Hilton Convention Centre, Jakarta, Indonesia. Contact: Australian Convention & Travel Services, GPO Box 2200, Canberra ACT 2601, tel (06) 257 3299, fax (06) 257 3256. ☐

IEEE ISSSTA '94, IEEE Third International Symposium on Spread Spectrum Techniques & Applications, *July 4–6,* University of Oulu, Finland. Contact: Prof Pentti Leppanen, University of Oulu, Dept of EE, Linnanmaa S1, SF-90570 Oulu, Finland, fax (358) 81 553 2845. ☐

IEEE International Symposium on Electromagnetic Compatibility, *August 22–26,* Chicago, USA. Contact: All About Meetings, 2301 Artesia Blvd, Suite 12-101, Redondo Beach, California 90278 USA, tel (310) 371 3438, fax (310) 371 1567. ☐

EUSIPCO 94, European Signal Processing Conference, *Sept 13–16,* Edinburgh, Scotland. Contact: Prof CFN Cowan, Dept of Electronic & Electrical Engineering, University of Technology, Loughborough LE11 3TU, UK, tel 44 509 223 468, fax 44 509 222 830. ☐

International Broadcasting Convention, IBC94, *September 16–20,* Amsterdam. Contact: tel 44 (0)71 240 3839, fax 44 (0) 497 3633. ☐

Telecommunications Show, *September 27–30,* Taipei. Contact: Far East Trade Service, tel (02) 232 6999, fax (02) 232 7429. ☐

3rd International Conference on Universal Personal Communications, ICUPC, *September 27–October 1,* San Diego, California. Contact: Dr Leonard Golding, c/o Hughes Network Systems, 11717 Exploration Lane, Germantown MD 20876, USA, tel 301/601 4130, fax 301/601 4040. ☐

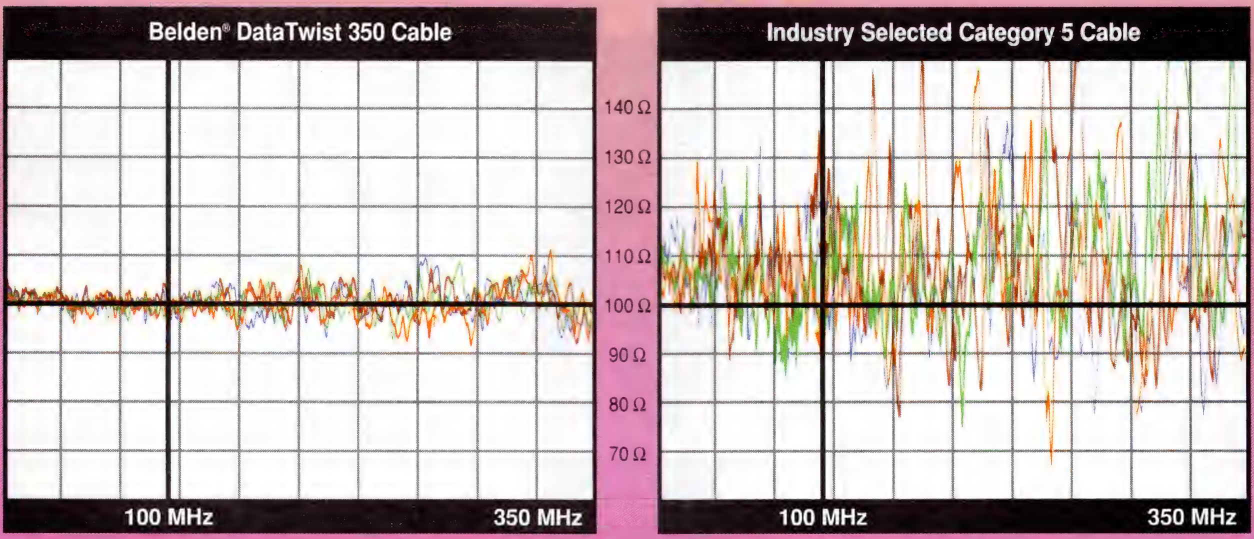
1994 Bipolar/BiCMOS Circuits & Technology Meeting, *Oct 10–11,* Minneapolis USA. Contact: Janice Jopke, CCS Associates, 6611 Countryside Drive, Eden Prairie MN 55346, USA. ☐

Electronics Show, *October 6–11,* Taipei. Contact: Far East Trade Service, tel (02) 232 6999, fax (02) 232 7429. ☐

IEEE International Carnahan Conference on Security Technology, *Oct 12–14,* Albuquerque New Mexico. Contact: Dr Estelle Zannes, University of New Mexico, Dept of Communication & Journalism, Albuquerque New Mexico, USA 87131. ☐

Singapore International Conference on Communication Systems ICCS '94, *November 14–18,* Singapore. Contact: IEEE Singapore section, #59D Science Park Drive, the Fleming, Singapore 0511, tel (65) 773 1141, fax (65) 773 1142. ☐

HarTec Limited Introduces
Belden
DataTwist® 350



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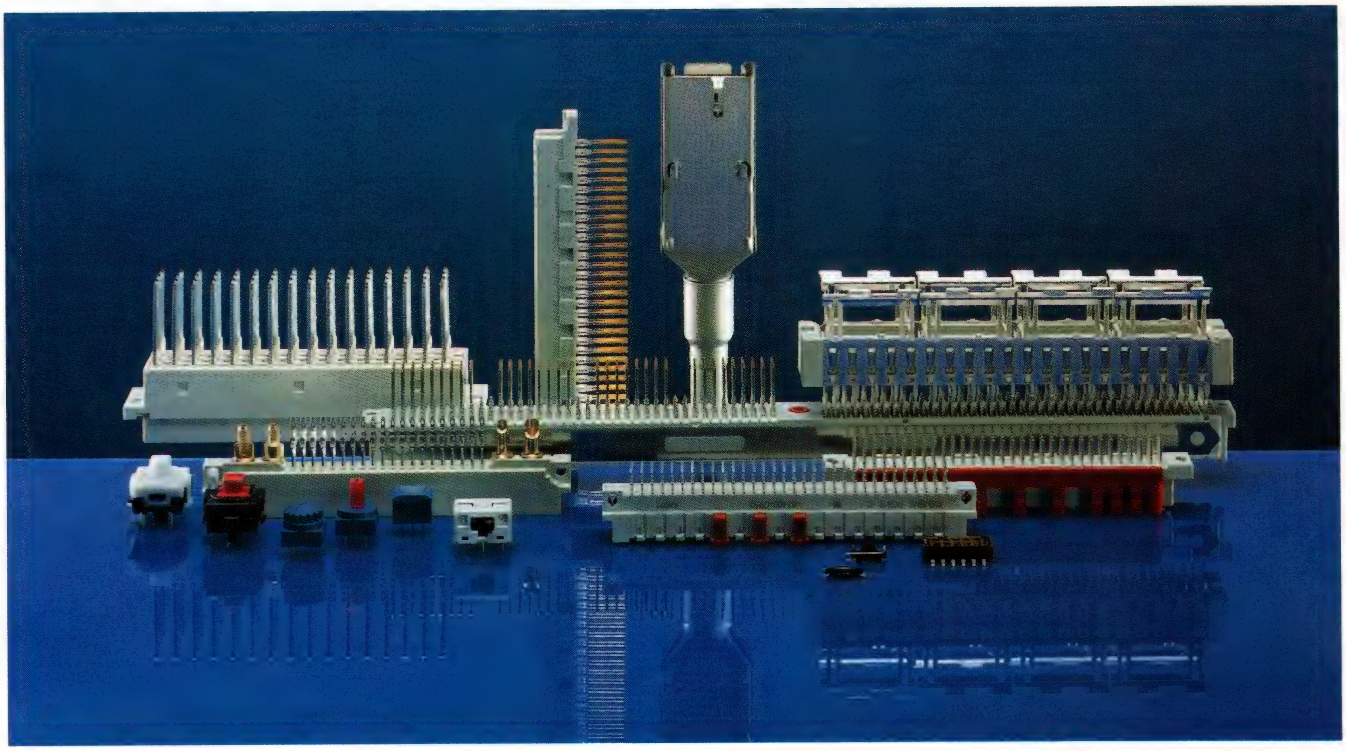
Cables & Connectors

This month's product survey looks at cables and connector products. For further information on any item, complete the Fast Fax form on page 85.



DIN connectors

Siemens has added to its range of DIN 41612 connectors by offering the modular designed Sipac-S series of EMI shielded 2.5 mm metric connectors.

The Sipac-S range, said to be more rigid than other Siemens connectors, has been designed to DIN 41642 and IEC917 standards.

As with all the products in Siemens' range of DIN connectors, the Sipac-S series is available in surface mount devices with premating contacts to protect against static charge. [794] (160)

ENTER 2400 FAST FAX

Mains test connector

RS Components has the RS Test-block, a mains test connector that is said to provide a safe method of temporarily connecting mains powered equipment to a suitable power source.

The Test-block features double pole switching through a hinged lid, screw input terminals, locking plastic cable grip, 'supply on' neon indicator and fully insulated, colour coded output clips. [794] (9788)

ENTER 2401 FAST FAX

Interconnect system

Utilux has released Mi II, a multiple interconnect 2.0 mm pitch x 2.5 mm row spacing connector system.

The system offers multi harness capabilities in crimp and IDT format. It provides a cost effective means of building multi branch assemblies for applications such as office automation, data communications and instrumentation, the company said. [794] (4337)

ENTER 2402 FAST FAX

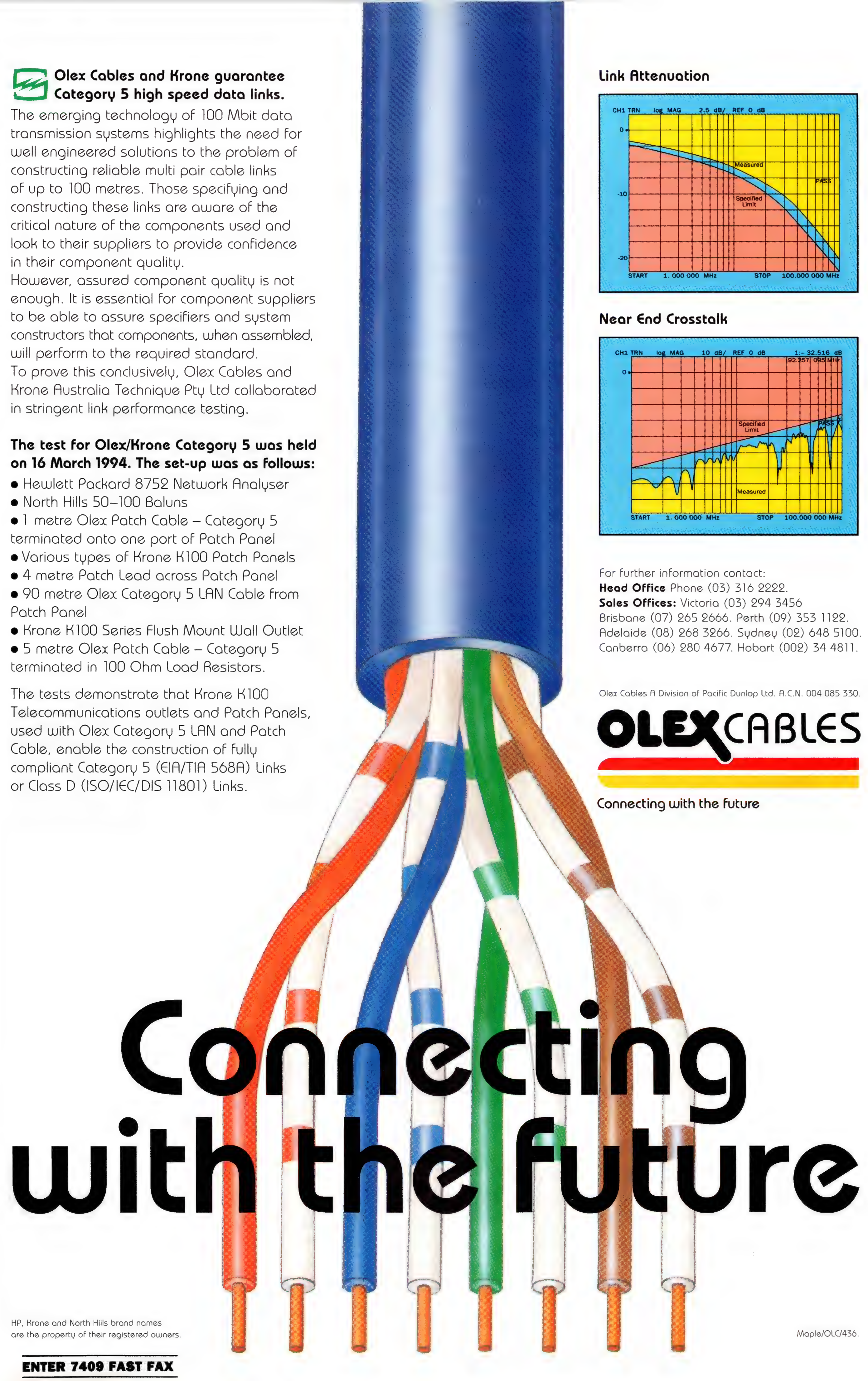
High density socket

RAE Industrial Electronics has available from 3M the 927F5 series right angle high density socket.

The socket's contact material is phosphor bronze with gold over nickel plating; the shell is steel with tin plating. It has a rated current of 5 A, a withstanding voltage of 1000 V ac at sea level and a temperature rating of -55 to 105°C.

Other features include EMI and ESD protection, a sealed back, a 0.35 in (0.89 cm) footprint and glass filled, polyester insulation material. [794] (9598)

ENTER 2403 FAST FAX



Olex Cables and Krone guarantee Category 5 high speed data links.

The emerging technology of 100 Mbit data transmission systems highlights the need for well engineered solutions to the problem of constructing reliable multi pair cable links of up to 100 metres. Those specifying and constructing these links are aware of the critical nature of the components used and look to their suppliers to provide confidence in their component quality.

However, assured component quality is not enough. It is essential for component suppliers to be able to assure specifiers and system constructors that components, when assembled, will perform to the required standard.

To prove this conclusively, Olex Cables and Krone Australia Technique Pty Ltd collaborated in stringent link performance testing.

The test for Olex/Krone Category 5 was held on 16 March 1994. The set-up was as follows:

- Hewlett Packard 8752 Network Analyser
- North Hills 50–100 Baluns
- 1 metre Olex Patch Cable – Category 5 terminated onto one port of Patch Panel
- Various types of Krone K100 Patch Panels
- 4 metre Patch Lead across Patch Panel
- 90 metre Olex Category 5 LAN Cable from Patch Panel
- Krone K100 Series Flush Mount Wall Outlet
- 5 metre Olex Patch Cable – Category 5 terminated in 100 Ohm Load Resistors.

The tests demonstrate that Krone K100 Telecommunications outlets and Patch Panels, used with Olex Category 5 LAN and Patch Cable, enable the construction of fully compliant Category 5 (EIA/TIA 568A) Links or Class D (ISO/IEC/DIS 11801) Links.

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Maple/OLC/436.

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Crimping tools

ECQ Electronics distributes a range of crimping tools from Daniels Manufacturing Corporation.

The Daniels crimping tool range allows for the attachment of a terminal or contact end to an electrical conductor. The tools have precision ratchet controls that are said to give an accurate crimp every time.

The crimping lines range through V.35 winchester contacts to BNC connectors. As well as a range of crimping tools, Daniels has various installing and removal tools. [311] (1199)

ENTER 2404 FAST FAX

Half pitch connectors

ODU Germany, represented locally by Mayer Krieg & Co, has released the ODU-Mini-Cart series of half pitch (1.27 mm) IDC, SMT and through hole connectors.

Available in 10, 20, 30, 40, 50, 60, 80 and 100 contact configurations, this range is said to be suitable for space saving board to board and board to cable connections.

The SMT versions of headers and sockets are equipped with removable pads to allow assembly using vacuum pick and place machinery. The connectors are available loose, in tubes or on tape and reel. [794] (88)

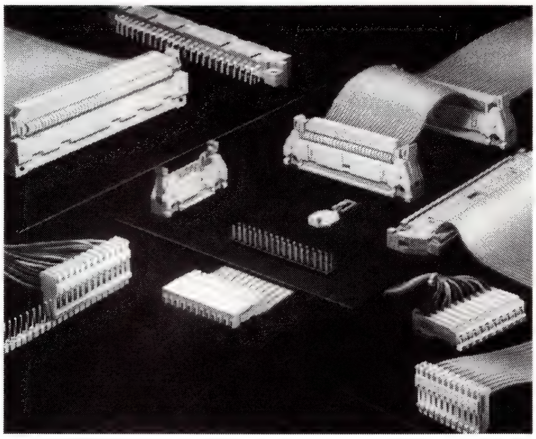
ENTER 2405 FAST FAX

IDC connectors

Panduit Australia has added to its line of Mas-Con IDC connectors with the IDC Hi-Power connector.

The Hi-Power connector uses hertz stress designed contacts and is available in two to 12 circuit positions for end and daisy chain applications. The connector uses a 0.156 pitch and 18 AWG cable and has a current capacity of 12.5 A. [794] (1591)

ENTER 2406 FAST FAX



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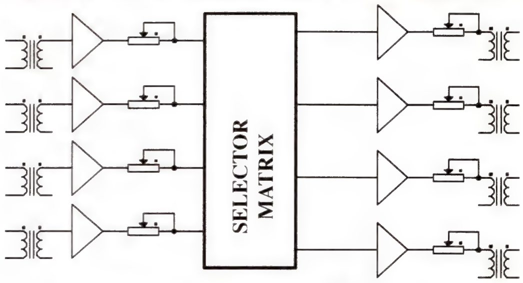
OMNI-NEWS

AUDIO BRIDGE



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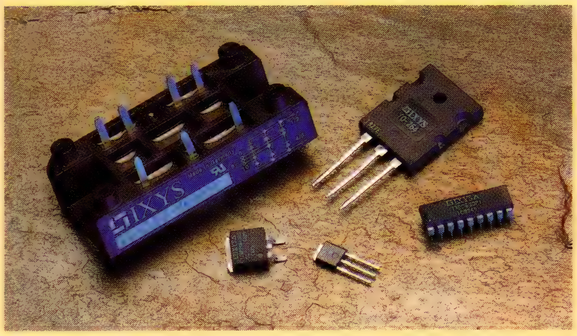

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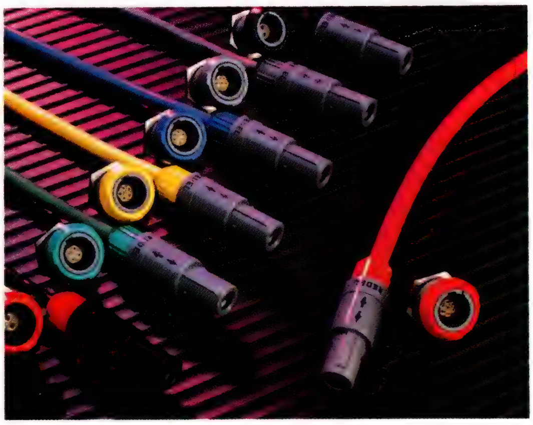

Self latching connectors

The Redel P Series connectors, distributed locally by the John Barry Group, is a range of connectors with a self latching system which is said to ensure a perfect connection on mating.

The P-Series connectors are made from Polysulfone, a UL certified auto extinguishable material that can be sterilised either by steam or gas. The contacts, gold plated over copper nickel, are said to ensure at least 1000 mating/unmating cycles without significant effect on the electrical characteristics.

One or two keys on the plug nose will only allow it to be mated with a socket having the same keying configuration. A keying system combined with colour coding can be incorporated on all connector types to assist in the prevention of mismating. [794] (1933)

ENTER 2407 FAST FAX

Protective caps

Sinclair & Rush has announced an expanded line of protective closures, caps and tips.

The range includes flexible vinyl, polyethylene, silicone and 'hi-temp' caps. These are said to be suited to protecting, masking, decorating, colour-coding and sealing threads, bolts, tubes, studs and fittings. The selection includes short, long and rectangular caps.

Sinclair & Rush also designs and supplies custom caps. [794] (10363)

ENTER 2408 FAST FAX

CT couplers

Open Wiring Systems has introduced Siemon Category 5 compliant CT couplers.

The CT-5 coupler modules are said to comply with the TIA/EIA TSB40 specifications for attenuation and near-end-crosstalk for any pair combination at 100 MHz. The couplers consist of one or two modular jacks connected to S110 connecting blocks. They are designed to fit existing CT patch panels.

The CT-5 coupler is supplied with T568A or T568B standard wiring. The "gravity feed" design has given the unit a slim profile, said to be suitable for installations in shallow raceways or modular furniture.[794] (11860)

ENTER 2409 FAST FAX

Miniature audio connectors

Litton has available miniature audio connectors. Available in 7 contact and 10 contact versions, the connectors are said to be suitable for connecting telecommunications units to microphones, headphones, or auxiliary equipment such as adaptors, amplifiers and sensors.

The contacts are made of gold plated copper alloy and are spring loaded. The shell of the receptacle connector is made of a special anti-magnetic steel with anti-reflective black chromium plating. The contacts can be solder type or dip-solder type. [794] (4165)

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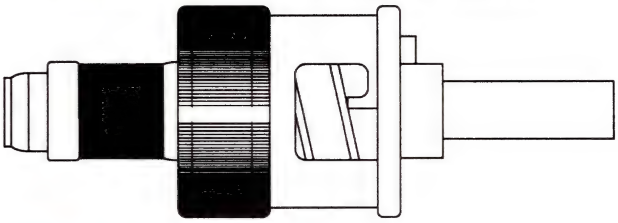

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This new **FST-SECURE** Optical Fibre Connector from the **SUHNER FIBEROPTIC** range of connectors offers an ideal solution where high reliability is required. Security is guaranteed due to its axially spring loaded mechanism and makes this connector ideal should tension be inadvertently applied to the connector mounting or boot assembly.

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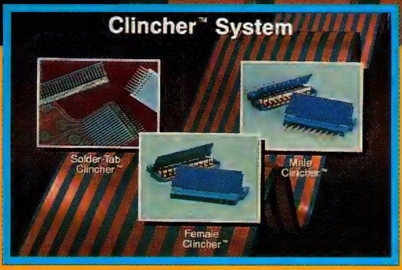
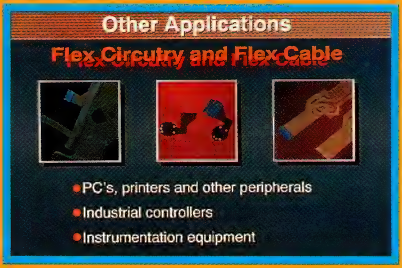


Bergs CLINCHER connectors fulfil industrial requirements for an economical and reliable means of terminating flat conductor, flat cable or flexible circuitry without the need for stripping. They are the perfect choice for applications where space and weight are at a premium. A full range of complementary male and female connectors is available.

- Microwave ovens and other appliances
- Calculator, cash register and other key-pad applications
- Home entertainment systems (VCR's)
- FAX's, modems and other telecommunication equipment

Protective one-piece housing cuts assembly costs

Designed for side-by-side stacking on a 2.54 mm (0.100") grid, the slimline, male and female CLINCHER connectors contain a single row of 2 to 34 terminals pre-assembled in a one-piece, snap-shut, thermoplastic housing (UL 94 V-O). This not only helps to reduce overall applied costs, it also ensures that the contacts are fully protected before, during and after assembly.



- PC's, printers and other peripherals
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Rapid assembly with no pre-stripping

Each terminal is equipped with two sets of teeth which, when terminated, simultaneously pierce the cable insulation and form a gas-tight crimped connection to the conductor. The housing is then snapped shut. In this way, all the conductors are connected simultaneously and the whole assembly procedure takes as little as 15 seconds.

Highly reliable long-life contacts

CLINCHER Connectors are designed to mate with 0.635 mm (0.025") square or round pins (or headers) on 2.54 mm (0.100") centres. The female end of each terminal has a dual-metal construction similar to that of the BERGCON system's PV receptacle. This ensures superior electrical and mechanical performance, even after hundreds of pin insertion/withdrawal cycles. It also provides a wiping action to clean oxides from the pin during entry. Contacts are available with either tin-lead all-over plating or with a gold stripe in the contact area only.

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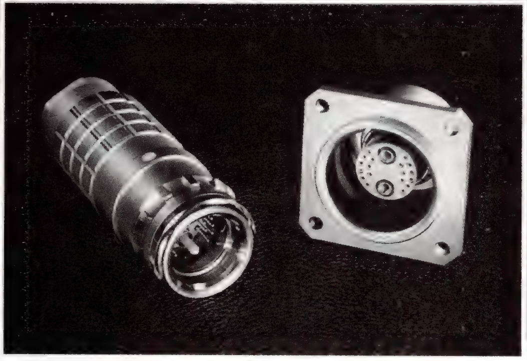

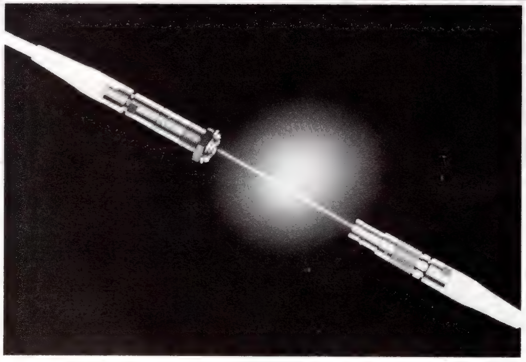

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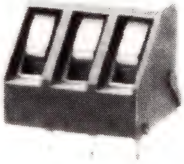

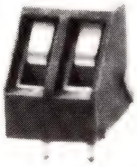

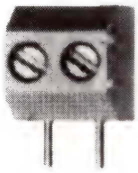

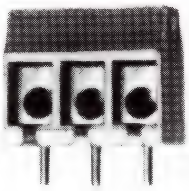

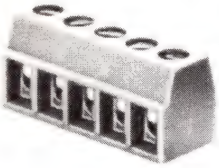

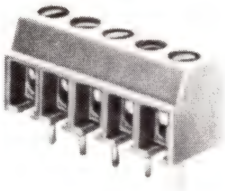

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Twisted pair cable

HarTec now distributes the Belden DataTwist 350 unshielded twisted pair cable. DataTwist 350 maintains stable electrical performance out to a frequency of 350 MHz.

DataTwist 350 cables are said to display superior performance characteristics across the frequency range when compared to other data grade UTP cables. The cable shows improved performance in capacitance unbalance, resistance unbalance, impedance, structural return loss, and attenuation.

DataTwist 350 achieves this by maintaining dimensional stability. This increased consistency allows for smoother and improved electrical characteristics that extend out to frequencies well beyond those verified by the Category 5 standard, the company said. [310] (7327)

ENTER 2411 FAST FAX

Mini coaxial connector system

The Har-pak mini coaxial connector system, manufactured by Harting Elektronik and distributed locally by Adilam Electronics, is said to combine the benefits of a standardised (IEC 1076-4-100) connector program with the performance quality of coaxial contacts.

The Har-pak system includes angled modules, straight modules, mini coax modules with press in termination, adaptors, 50 Ω terminators and cable assemblies. It allows the transmission of high frequency signals up to 2.5 GHz.

Liquid Crystal Polymere (LCP) has been used for connector housing. Six mini coax contacts are realised in a 1 SU module of 25 mm in length, giving space for 60 mini coax lines on a double Eurocard. [794] (25)

ENTER 2412 FAST FAX

SC style connector and adaptor

ATC, distributed by Anderson Network Corporation, has introduced a simplified four piece SC style connector and adaptor, designed for fibre optic systems requiring high density and high performance connections.

Single-mode and multi-mode connectors have push-pull coupling for fast and easy installation. Features include precise polish zirconia ferrule for improved return loss and low insertion loss (0.1 dB multi-mode and 0.2 dB single-mode).

ATC's SC style connectors are designed according to NTT specifications. [794] (10857)

ENTER 2413 FAST FAX

Metric system connectors

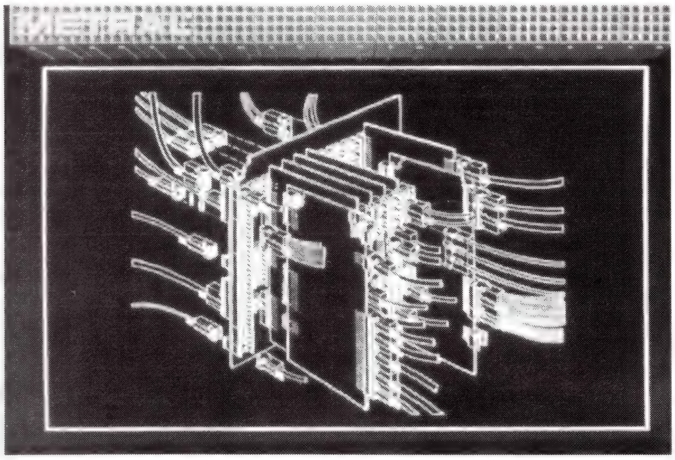
VSI Electronics is distributing Metral Connectors: metric system connectors that are based on a connector grid of 2 x 2 mm.

VSI says a 2 mm pitch provides the best balance between density and cost. With a four row system, up to 456 contacts can be made on a double height Eurocard using conventional PCB manufacturing and component assembly techniques.

The Metral connector functions are separated on to specific modules, a feature that is said to simplify their use and avoid the cost of expensive multi function connectors. Building block modules can be aligned on a printed circuit board without loss of position.

The range includes press fit, solder to board and IDC for board to board and cable to board applications. Coax, mini-coax, fibre optic and EMI/RFI shielded connectors are also available. [794] (65)

ENTER 2414 FAST FAX



PVC cable ducting and accessories

Bell-MEM division of Bell-IRH Industries has introduced the Bell-Duct range of PVC cable ducting and accessories.

The Bell-Duct range includes high impact, self extinguishing 94V-0 PVC in both solid or slotted types. Various sizes are offered.

A range of Bell-Duct cable ducting accessory items, such as spiral cable bindings, flexible bushings, cable ties, mounts and glands, are also available. [311] (8854)

ENTER 2415 FAST FAX

Mini-UHF crimp plug

Link Connectors has released a mini-UHF crimp plug for cellular communications. A miniature version of the UHF Series, it is designed for applications where space is restricted.

The Mini-UHF crimp plug is suitable for use up to 500 MHz. [794] (1030)

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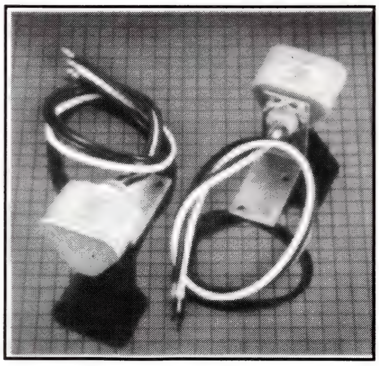

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CABLE MANAGEMENT & IDENTIFICATION

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On the fast track to comms testing

Mask and template techniques offer quick solutions for testing to communications standards.

V Prasannan and *Kevin Smith* explain how.

Evolving communications standards — integrated services digital network (ISDN), fibre distributed digital interface (FDDI), and synchronous digital hierarchy/synchronous optical network (SDH/SONET) in particular — will simplify and streamline voice and data links locally and globally.

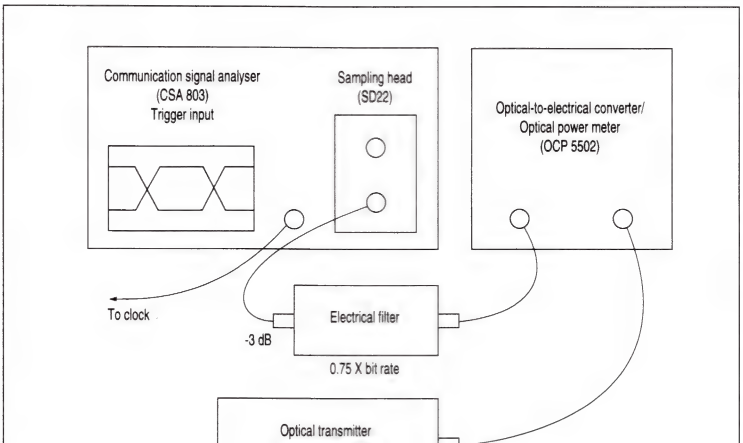

Figure 1. A typical SDH/SONET eye-diagram test set-up uses the recovered data clock for external triggering. If the device under test has an optical output, an optical to electrical converter is needed.

But at the same time, designers and manufacturers of digital communications equipment must adopt new test philosophies and capabilities for efficiently evaluating compliance with the new standards. Examples are pulse template and eye diagram mask testing which are recommended by the new standards.

Templates and masks are graphic devices using similar methods to specify allowable limits for waveforms. A simple unipolar data pulse is a good example. The pulse can be specified by a list of parameters and limits: top amplitude, ±2.5 per cent of nominal; overshoot, less than 25 per cent of nominal top; 50 per cent width, nominal ±0.725 ns, and so on. Alternatively, the specification limits can be presented as normalised points on a graph.

Connecting the upper limit points with straight lines establishes an upper boundary for the pulse shape. Similar connection of the lower limit points establishes a lower boundary. Together the two boundary lines create an envelope, or template, that defines a region in which the pulse shape is acceptable. So any pulse that fits within the template is acceptable.

Similarly, masks are devices for graphically expressing data signal specifications. But masks outline regions of unacceptability, rather than acceptability. Data conditions that intrude into a masked region are out of compliance with the mask specification.

Because the general concepts are so similar, template and mask are often interchangeable terms. They are a convenient and comprehensive way of graphically specifying data wave shapes.

Templates and masks also can be a quick and convenient way to ensure that waveforms comply with the new communication standards. To do so, the FDDI data pulse or SDH/SONET data eye diagram is displayed on an oscilloscope. The corresponding template or mask is overlaid on the waveform display. If the displayed waveform fits the template or mask, the wave shape is in compliance. Designers don't need to measure a multitude of individual waveform parameters. They just make sure the waveform fits the specified template or mask.

The concept of template testing is quite straightforward. To implement it there are several requirements including the ability to capture pulse waveforms at high data rates, provide optical to electrical conversion in the capture system, the addition of template or mask overlays to the data displays, and analysis of results.

Because waveshapes must be observed and, possibly, some parameters measured, an oscilloscope is a basic test tool for FDDI and SDH/SONET compliance testing. The type of oscilloscope and the bandwidth needed depend on the testing method chosen and the system's data rates. A wide range of general purpose

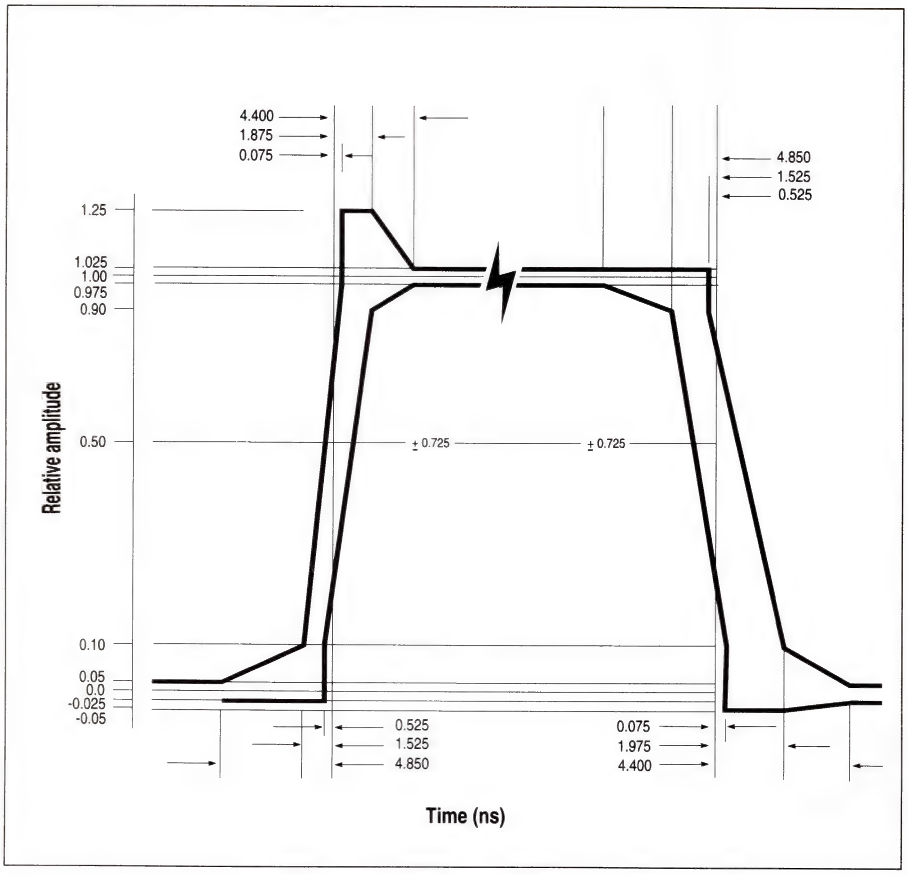

Figure 2. An FDDI pulse template defines the limits within which a pulse must fall. This graphical test technique is much faster than measuring numerous pulse parameters to verify compliance with the standard.

oscilloscopes can meet the bandwidth requirements for viewing 125 Mb/s FDDI waveforms. The data rates used in SDH/SONET channels are another matter.

For example, 2488.32 Mb/s waveforms (SDH-16/SONET STS-48 signals) may need an oscilloscope bandwidth as high as 20 GHz for accurate measurement of rise times, fall times, jitter, and other waveform parameters specified by the standard. High triggering bandwidths are also needed to create eye diagram displays at such speeds.

Generally, GHz bandwidth acquisition means using an oscilloscope with direct input sampling heads — a scope with no preamplifier ahead of the sampling bridge. The acquired signal goes directly to the sampling bridge for sequential sampling. The advantage in this technique is the only input bandwidth limit is that of the sampling bridge. Today's direct input sampling technology delivers oscilloscope bandwidths to 50 GHz, allowing coverage of the highest SDH/SONET channels.

Although direct input sampling offers a great bandwidth advantage, the tradeoff is an input signal dynamic range limited to 1 Vpk-pk.

As well as waveform acquisition and analysis capability, it is also important to remember FDDI and SDH/SONET are optical based systems. This means optical to electrical (OE) conversion is needed for any testing done on the optical side of the system. *Figure 1* shows a test set up for SDH/SONET eye diagram compliance testing.

The output of the optical device or system under test (an optical transmitter in this example) connects directly to an OE converter. The converter's electrical output goes to a filter specified by the SDH/SONET test standard. The filter's output is then fed to the oscilloscope's direct input sampling head. The scope is externally triggered by the system data clock to provide an eye diagram display.

If the OE converter in this set-up has a power meter, optical components also can be evaluated for compliance with average optical power requirements. If the converter doesn't have an integral power meter a separate optical power meter must be added to the system.

A similar test set-up without the OE converter can be used to test the electrical side of FDDI or SDH/SONET systems. The electrical output (of an optical receiver, for example) can be connected directly to the scope's sampling head or amplifier plug-in.

To simulate the random data patterns of digitised voice and other data communications signals, the test engineer applies pseudo random bit sequence (PRBS) patterns to the receiver or transmitter to be tested. A pattern generator can be used for this. In addition to containing the PRBS, the generator output must conform to the applicable FDDI or SDH/SONET standards.

For example, for SDH/SONET, the instrument must generate a frame that contains both the payload (the PRBS used for testing) and the path overhead.

The simplest way to obtain a PRBS in the necessary transport format is to use the pattern generator from a SONET or FDDI compatible bit error rate tester. The output of this type of generator can be applied to the device or system being tested, and the example test set-up can be used to capture the data waveforms and verify compliance to the standard.

FDDI compliance testing can be done by measuring individual pulse parameters — transition times, duration, amplitude, aberrations, symmetry, and so on. Or compliance can be verified by making sure the data pulse fits within a specified FDDI pulse template (see *Figure 2*).

Although the FDDI standard specifies pulse templates, the concept is not an FDDI innovation. In the past, telephone equipment manufacturers have developed templates for checking wave shape compliance against their internal and external standards. The benefits have been speed and simplicity.

The template technique hasn't always been as efficient as it might be. This is because the traditional approach is to scribe or print the pulse template on a sheet of plastic cut to fit over an oscilloscope faceplate. The scope display of the data waveform is then positioned for the best fit within the template. Any parts of the waveform not fitting within the template bounds are considered template violations.

The problem is, the traditional approach is entirely manual. It relies heavily on the skill and attention of the person doing the test for proper positioning of the waveform within the template. Further, the operator must still make rise time, fall time, and other measurements to document violations for any unit failing the test.

A more efficient approach is to use a digitising oscilloscope with envelope or reference waveform processing capabilities. These scopes can electronically create a template envelope on-screen along with the data waveform display. Control software then automatically fits the data

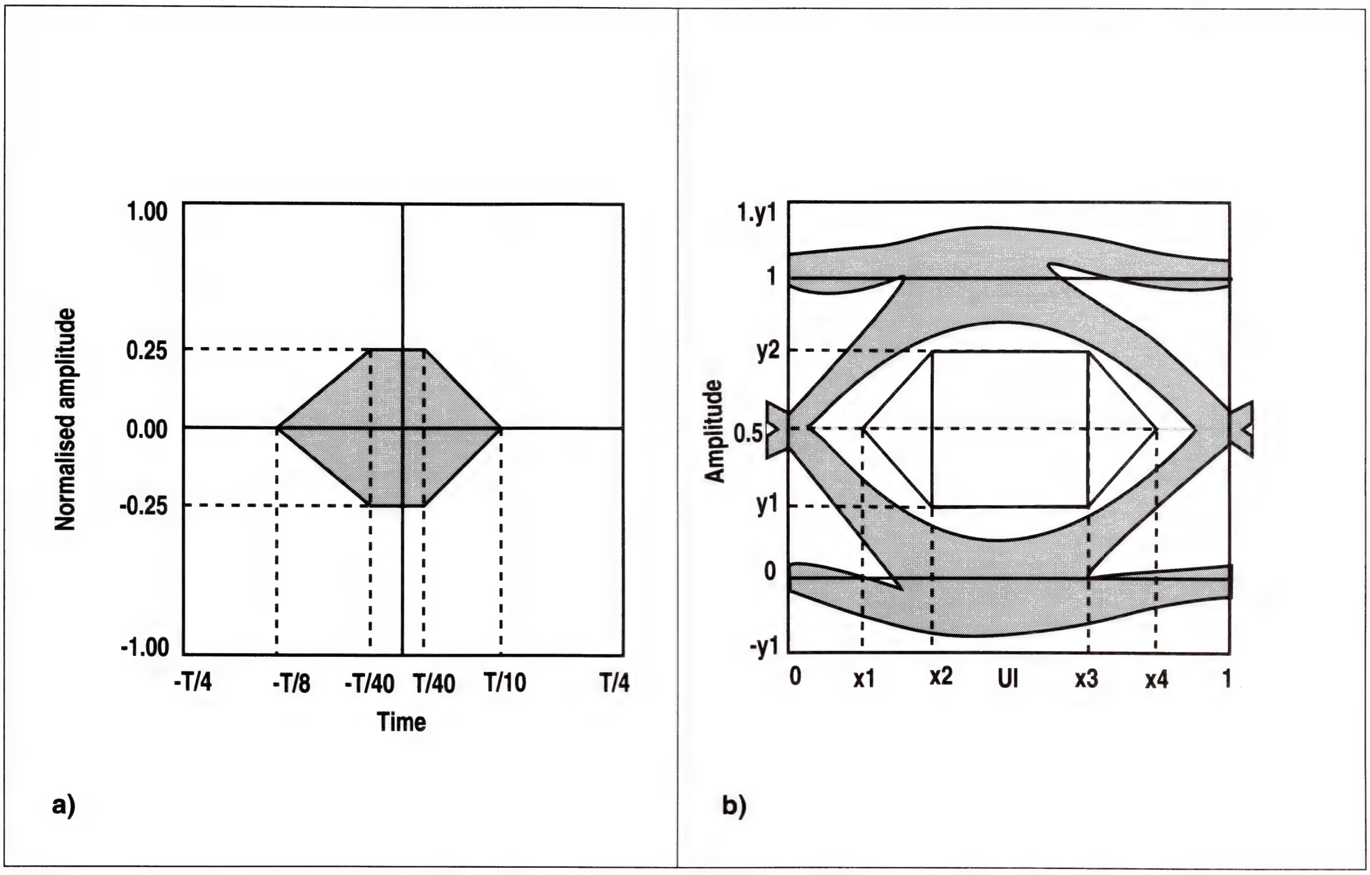

Figure 3. SDH/SONET eye-diagram masks vary depending on the data rate and interface being tested. A mask for STS-3 signals at the cross connect (a) differs from that for the optical transmit signal (b).

waveform to the template and logs any waveform points exceeding the template bounds. The scopes can also automatically measure and display key waveform parameters such as rise and fall times. If needed, the entire screen display can be sent to a printer to document the results.

As well as automating the procedure, a digitising scope also offers the advantage of allowing templates for different data rates and standards to be stored in software. These templates, whether electrical or optical, can be quickly retrieved as needed. Additionally, templates can be modified in software or new ones created to keep pace with evolving test needs.

A similar template concept can be used for SDH/SONET eye diagram testing, which evolved because of the higher data rates of SDH/SONET systems. At 155 Mb/s and up, it is difficult to pick out one pulse for template testing as is done in a lower speed system.

SDH/SONET specifies an eye diagram, which is a composite of multiple pulses captured as a series of oscilloscope sweeps, each triggered by a data clock pulse (see *Figure 1*). The variations in the data waveforms on the scope's vertical input channel are seen as multiple overlaid data pulses synchronised with the clock. These overlaid pulses form the eye diagram, which should fall within the limits defined by the appropriate masks (see *Figure 3*).

If the data pulses were ideal, with instantaneous transitions and no noise or jitter, the eye diagram would be a series of end to end boxes (see *Figure 4a*). But real life pulses have finite transition times, which create the crossing points on either side of the eye opening. Uncertainties due to noise and jitter broaden the displayed signals and cause closing of the eye in the diagram (see *Figure 4b*).

Although transient events such as voltage surges may cause data errors, the more likely cause is the statistical effects of noise and jitter. The eye diagram contains the statistics for both amplitude uncertainty (noise) and timing uncertainty (jitter). These statistics can be extracted by using histograms to construct distributions for the two levels and two adjacent crossings in the eye diagram.

Communication theory states that any binary signal has a finite error probability due to uncertainty in the location of the two signal levels. The error probability is determined by the difference between the levels and the distribution of the signals at the two levels. Signals with large level differences and a smaller standard deviation at each level are less likely to contain errors. These two factors, the difference between the two levels and the level distributions help determine the opening height of eye pattern masks.

Similarly, jitter creates a finite error probability. Jitter can be caused by thermal effects in receivers, clock recovery drift, clock asynchronicity, and other effects that cause a timing error probability for sampling the data. This probability is based on the width of the eye pattern opening relative to the standard deviation of the signal's timing uncertainty. Therefore these statistics are used to determine the opening width of eye pattern masks.

In summary, a large eye opening means the system has greater tolerance for amplitude and timing variations; a smaller opening means a smaller tolerance. Thus SDH/ SONET eye diagram masks offer a clear indication, based on waveform statistics, of transmitted signal quality. In addition, as is the case with pulse template testing, eye diagram

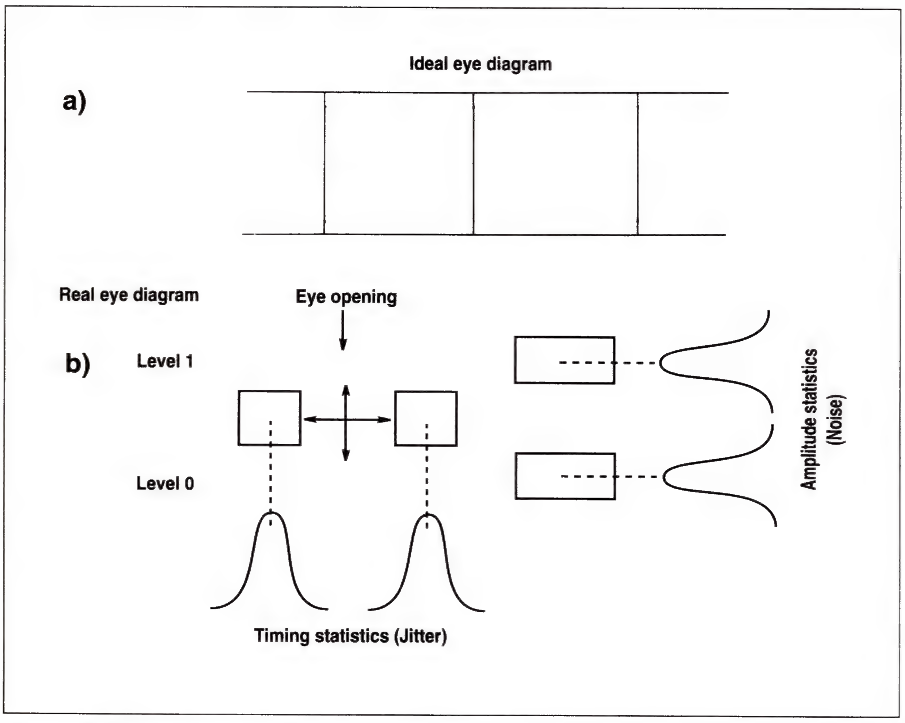

Figure 4. The eye diagram for ideal data pulses would be a series of boxes end-to-end (a). In a real-world eye diagram, variations in level amplitude and the transition crossing provide information about noise and jitter in the signal (b).

testing can be automated with a digitising oscilloscope. However, the process is more complicated because eye mask fitting is based on the statistics of multiple waveforms rather than on one stored pulse trace.

The most direct and valid way to fit the mask to the waveform is to use histogram distributions to define top line (100 per cent) and baseline (0 per cent) levels on the eye diagram. Similarly a histogram can be used to find the 50 per cent crossing level. This information along with standard mask data can be used to compute and display the mask against the eye diagram. If no data waveform points fall into the mask region, the test is passed.

Histograms can be computed at various locations on the eye diagram to measure jitter and noise distributions. This presumes the eye diagram waveforms can be continuously acquired and stored in a statistical database. Only a few instruments have the amount of memory and processing power needed for this task.[1270] (95) ☐

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The authors are with Tektronix.

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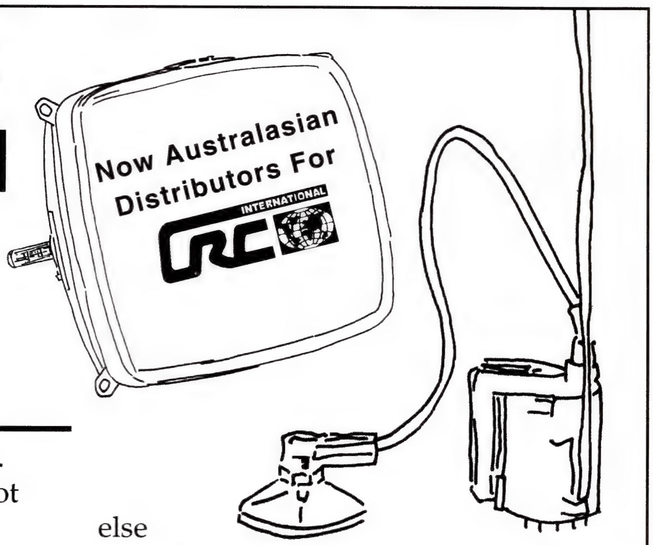

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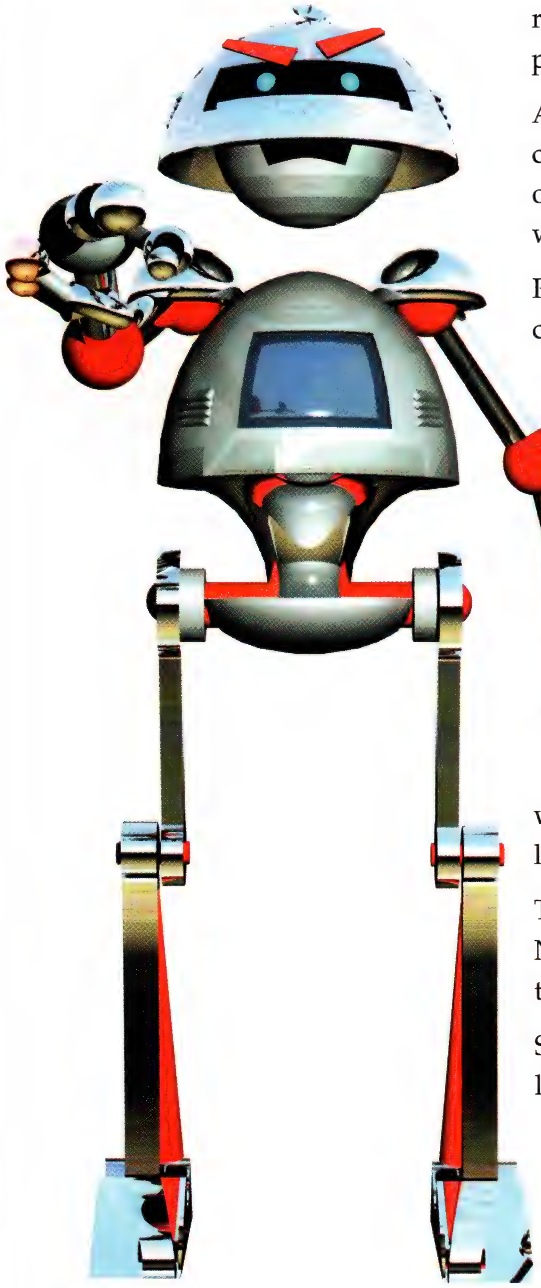

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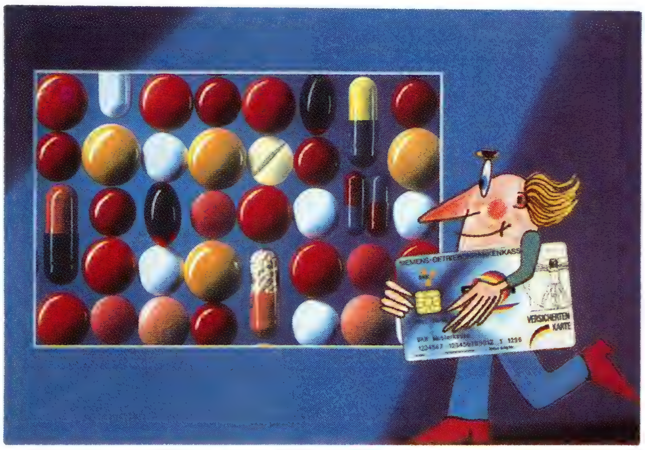
PHOTOSYNTHESIS

Smart solution on the cards

AEE editor *Jennifer Liston* takes a look at technology that is already revolutionising traditional business transactions.



Companies are now channelling their energies into finding more secure ways of storing and manipulating information. In a world where the security of business transactions is threatened, smart card technology seems to offer a solution to at least some of the problems associated with traditional magnetic strip technology.

Industry giants such as Siemens, AT&T, Motorola, SGS Thomson and others are scrambling to cash-in on a world market that market research company Frost & Sullivan says exceeded $1 bn last year and will exceed $4 bn by the year 2000.

In many ways, smart cards would seem to have it over the magnetic strip technology of today's "plastic card". Although the magnetic strip card is inexpensive to produce, it is open to fraud and large scale copying. It is also possible for the data in a stolen card to be read and copied into multiple counterfeit cards with relatively unsophisticated equipment.

Smart cards have built-in intelligence, are more secure and are easier to use.

Siemens estimates the world-wide chip card IC market was worth DM20 m (about A$16.4 m) in 1987, DM160 m (A$131 m) in 1992 and predicts it will be worth DM965 m (A$790.9 m) by 1997 — a growth of 49 per cent each year.

But as with any new technology, smart card technology must prove itself before moving into the big time.

The unit cost of a smart card is higher than that of a magnetic strip or memory card because of its greater sophistication and higher initial set-up cost. But manufacturers claim this cost is offset by the improved security, the ability to configure the card after issue and its data storage capabilities.

Smart card applications would seem to be limited only by the imagination. A form of health care smart card is being introduced this year for all Germans, and another card is now widely used in Denmark for telephone applications.

In China, Siemens is working with the gas authorities to introduce smart card technology for metering applications.

Motorola has already supplied smart card ICs to major smart card manufacturers including Bull, Citizen, Datacard, Smart Card Systems, Philips, and Schlumberger.

Other possible applications include GSM cards; image storage; pay TV; road toll collection; data entry systems; ID cards; computer data links; electronic purse; public services such as libraries, transport, sports facilities, driving licences; and finance, credit and banking applications.

In Australia there are a number of small projects in which the technology is being used, but these are limited in size. Siemens in Melbourne is discussing potential applications with commercial interests in banking and insurance and government agencies. It is estimated that 128,000 cards were in circulation in Australia last year.

SGS Thomson claims to have 65 per cent of the world-wide smart card IC market share, Siemens claims to have 30 per cent. To date Motorola has shipped some 40 million devices. Other players include Hitachi, Toshiba, OKI and Texas Instruments.

Jayne Ashworth, smart card IC specialist with Siemens in Munich, was in Australia recently to train Siemens' staff in the company's smart card IC product range. Her other brief was to assess the Australian market, the major players here, and the market potential.

Siemens' products feature three types of chip: the intelligent memory IC, the microcontroller IC and the cryptocontroller IC.

Memory ICs are usually used for one particular application, such as a counter in telephone cards, prepaid cards, or electronic purse cards; or for numeric information, for example in health insurance.

Microcontroller card memory can be split into functions, similar to a PC. One section could be used for a health insurance number, another for phone, another for banking, and so on. But true multiapplication hasn't arrived because of a non standard approach by the service providers, says Ashworth.

The cryptocontroller card features a basic controller IC with a crypto-arithmetic unit to encrypt and decrypt information. Siemens claims its cryptocontroller card is eight times faster than other comparable cryptocontroller ICs. It uses asymmetric algorithms, where sender and receiver have different keys and is based on Rivest, Shamir, Adleman algorithm (RSA) encryption.

Siemens' chipcard has security areas that can not be read or changed, and are accessible only with a PIN. The chip is protected against analysis by built-in sensors and mechanisms that cause the chip to reset or destroy itself.

There are also built-in mechanisms in the chip to detect against static analysis at low frequency and data manipulation at high frequencies. The chip can also detect if the voltage supply is interfered with and the chip resets itself.

One limiting factor is that as the microcontroller chip becomes larger and as EEPROM size increases from 4 to 8 to 16 Kb, the card itself becomes less flexible. Ashworth says the maximum realistic chip area is 25 mm^2 — any higher could make the card too rigid resulting in too much stress on the chip.

Siemens has a manufacturing capacity of 100 million modules a year. The company relies on its experience as a DRAM manufacturer to manufacture the smart chips. "It has a good foundation from the megabit technology," says Ashworth.

Motorola's smart card chips include security algorithms. Built-in individual card IDs mean each card is unique and identifiable. Various physical and software features are designed into the microprocessor. Once the customer software

Siemens' smart card specialist Jayne Ashworth.

has been dropped into the ROM, the polysilicon fuses are physically blown to prevent any future access to memory.

Where can the technology go from here? Motorola believes enhancements will include wider supply voltage range, lower power consumption, faster clock speeds, more memory, mixed memory (EPROM and EEPROM), flash EPROM, and greater system integration such as RF transceiver elements on the same silicon as the MOS microprocessor and memory.

Motorola also believes there will be a drive towards more complex cards to support multiple applications and single, more sophisticated real-time data processing involving complex biometric data. ☐

CARDS ON THE MOVE

A public transit fare collection project in Manchester in the UK has begun using 5000 smart cards and 145 readers provided by Sydney-based **Intag International**. Intag's contactless **In-Charge** system uses radio waves to exchange data between the bus ticketing systems and the smart card held by the passenger. The card can also be read effectively even when in a wallet or handbag up to 15 cm away.

Greater Manchester Passenger Transport Executive promoted the card as a single card to use for payment in over 3000 buses and all rail and light rail stations within Greater Manchester. This project is described as the world's largest application of contactless smart card technology and is being monitored closely by many. The system was installed by Perth-based ERG Electronics.

The In-Charge system is also being trialled for automatic fare collection in public buses in Gardena, Los Angeles and Torrance in California. ☐

FINGERTIP BANKING

The executive secretary of the Automatic Data Capture Association (ADCA), David Kyle, says card convenience and its universal acceptance bridges the way for increased use of smart cards for transactions of all kinds.

West Australian company **Intellect Australia** has produced a pocket sized calculator unit called **Microbank** to enable smart cards to link with fingertip banking. The device becomes a simple modem to transfer funds electronically over the phone into the smart card in one's pocket or purse. ☐

SMART CARDS BECOME CHEAPER TO MAKE

The May 23 edition *Electronics* reports that a new production process for smart cards has been developed by **Sempac** in Switzerland. The company has patented a process claimed to produce up to 700 smart cards an hour, halving the cost of existing technology.

The process resembles semiconductor assembly technology, with the addition of a plastic injection moulding press. Both sides of the card are printed simultaneously and the size of the package is 0.7 mm. ☐

TOUCH MEMORY CAN

In a variation on a theme, **Dallas Semiconductor** has a range of **touch memory** chips that are packaged in coin-shaped MicroCans to withstand harsh environments.

The coin surfaces of the non volatile touch memory can be extended to allow automation. Each device contains a unique serial number lasered into the chip at the time of manufacture — a permanent registration code engraved in silicon that provides absolute traceability.

The devices can hold up to 4 Kb of information. A distance of 300 m between the touch memory and the chip it is communicating with can be accommodated. ☐

Device	ROM	RAM	EPROM	EEPROM	I/O	Other features
MC6805SC01	1.6 K	36	1 K	-	1	-
MC68HC05SC11	6 K	128	8 K	-	5	-
MC68HC05SC21	6 K	128	-	3 K	5	GSM spce option
MC68HC05SC24	3 K	128	-	1 K	5	1 µA stop Idd, 3-6 V operation
MC68HC05SC27	16 K	240	-	3 K	5	GSM spec option, 3-6 V, Wdog, 1 µA stop Idd, 5 MHz internal operation option

Motorola products.

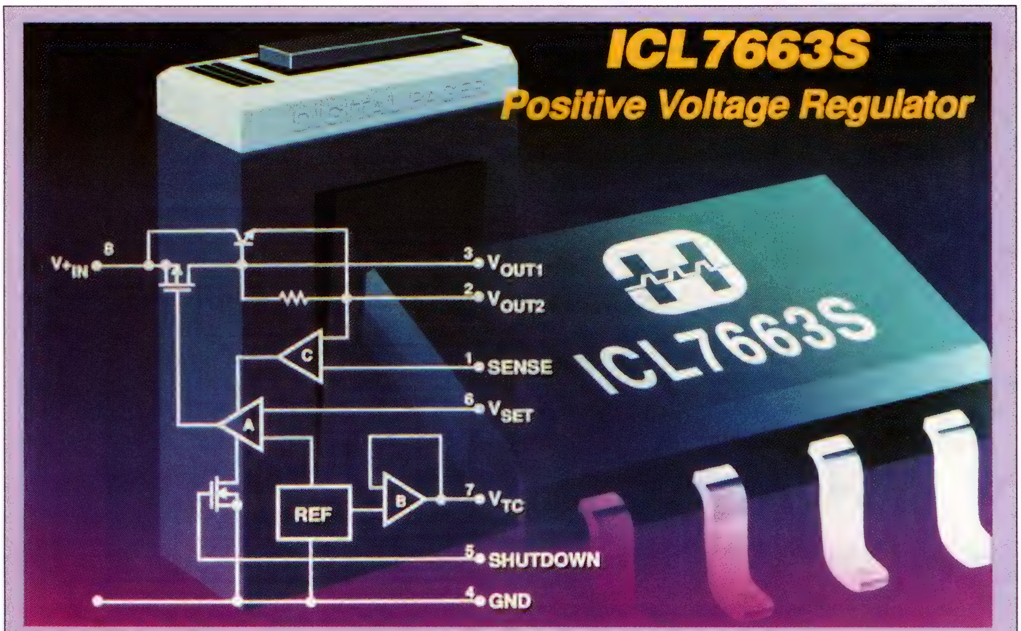
Device	ROM	EPROM	EEPROM	RAM	Transport code/ PIN logic security?	Security features
SLE44C10	4 K	32 B	1 K	128 B	Y	DES
SLE44C40	8 K	32 B	4 K	256 B	Y	DES
SLE44C80	16 K	32 B	8 K	256 B	Y	DES
SLE44C200 (Cryptocontroller IC)	10 K	32 B	2.5 K	256 (+350)B	Y	RSA, DSA

DES: data encryption standard. RSA: Rivest, Shamir Adleman algorithm.

Siemens products.

Device	ROM	RAM	EP/EEPROM	Notes
ST1821	2 K	44	1 K	-
ST1834	3 K	76	4 K	-
ST16301	3 K	128	1 K	-
ST16612	6 K	160	2 K	-
ST16B22	11 K	224	2 K	-
ST16623	6 K	224	3 K	-
ST16V623	6 K	224	3 K	-
ST16F48	16 K	288	8 K	-
ST16XYZ	-	-	-	User defined ROM, RAM, EEPROM. High security

SGS Thomson products.



Micropower voltage regulator

Harris Semiconductor's ICL7663 micropower voltage regulator is available in a SOIC version for surface mounting through VSI Electronics.

The ICL7663SA SOIC version is 50 per cent smaller than the same part packaged in a plastic mini-DIP. It is said to provide high output precision with low power requirements. The chip features one per cent output voltage accuracy resulting from its internal band-gap voltage reference. It offers a 10 μA maximum operating supply current over the full temperature range and has a voltage-set control terminal that draws one μA additional current.

Applications for the ICL7663SA are said to include battery powered portable devices such as portable test instruments, pagers and remote data loggers. [841] (65)

ENTER 2418 FAST FAX

Electronic systems housing

L&B Electrical Components now distributes the CP 6000 range of electronic systems housing equipment from Rittal. Said to be suitable for applications in the field of operation and display, the range consists of a support arm system, 18 different housing types and four keyboard units.

Designed for customary controls, the CP 6000 range is modular, easy to assemble, sturdy and protective, Rittal said. The side panels and back door are detachable for configuration and maintenance access. [1250] (214)

ENTER 2419 FAST FAX

Soldering handpiece

Pace, represented in Australia by Solder Static, has developed a soldering handpiece that combines balance and control with low temperature, high capacity heating.

The Sodr-Pen's natural balance and control is said to minimise grip stress, reducing operator fatigue. Accurate heat control permits production soldering at low temperatures, a feature said to eliminate thermal damage to assemblies. The Mini-Wave tip allows the soldering of QFPs with lead counts of 180 pins or more at 525°F (273°C) and has sufficient thermal delivery to permit work on heavy multi layer circuit assemblies.

More than 60 surface mount and thru-hole tip choices are available for Sodr-Pen. [2300] (9209)

ENTER 2420 FAST FAX

Hand-held meters

A range of hand-held meters has been released by Yokogawa. The meters include current clamps with ranges from 200 mA leakage current to 1000 A.

A selection of 23 DMMs is available from low cost pocket meters to top of the range 50,000 count, 0.04 per cent basic dc accuracy DMMs. Various meters have special functions including RPM, temperature, dBm, auto reverse diode testing, backlit displays, adaptor inputs, display memory, frequency, true RMS, bar graphs and safety shutters to prevent selecting volts when the probes are plugged into the current input.

All of these meters are built under the ISO 9001 quality management system. [1270] (1381)

ENTER 2421 FAST FAX

Digital telephone answering device

Zilog, through R&D Electronics, has available three digital telephone answering device (DTAD) controllers with complete development kits. The Z89167, Z89168 and Z89169 offer a turnkey solution for OEM manufacturers.

The three dual architecture controllers integrate a Z8(R) microcontroller and a 16 bit DSP core, reducing board space. The Z89167 offers 24 K of Z8 ROM, the Z89169 offers 32 K of Z8 ROM. The Z89168 is a ROM-less version. All three contain 8 K of DSP ROM, a feature said to make the controllers capable of advanced functions such as multiple mailboxes and speaker phone capabilities.

All three are available in 84-PLCC and 100-QFP packages. Zilog's accompanying development kit includes the application software, a demonstration board, schematics and a bill of materials. [841] (70)

ENTER 2422 FAST FAX

Quad processor expandable computer system

Motorola Computer Group has extended its Series 900 range of expandable computer systems with the addition of a quad processor version. The Series 900 Model 984 is based on four Motorola MC88110 symmetric superscalar RISC processors and has expansion capabilities that allow for a variety of configurations and upgrades.

The quad processor configuration, supported by true symmetric multiprocessing architecture of Unix system V/88, provides up to 612 MIPS performance. This is said to make the Model 984 capable of supporting more than 1000 users in a client server environment.

As with all servers in the Series 900, the Model 984 incorporates a snap together modular design. The systems applications processor is housed in a compact CPU module that is expandable by 'snapping on' SCSI device expansion modules and VME expansion modules. [387] (2192)

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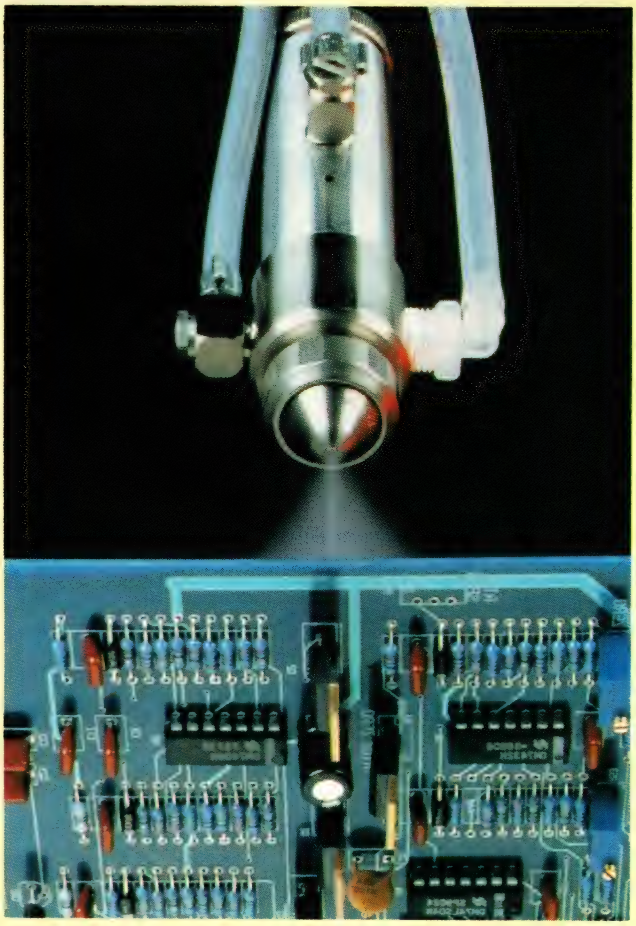


Spray fluxing valve

The EFD 780S-SS needle-type spray valve, distributed by Precision Group, makes 'no clean' spray fluxing possible. In SMT Type III mixed technology and through hole board assembly, the 780S-SS's spray fluxing technique is said to improve flux performance and reduce flux waste.

Through using low solid fluxes applied by controlled spray, post solder cleaning can be eliminated, Precision Group said. The valve provides uniform spray pattern control, eliminates flux deposits on the top of the board and provides through hole wetting, said to produce ideal top side fillets.

Solvent evaporation and flux contamination is avoided as the flux is contained in a sealed tank reservoir. The 780S-SS feature adjustable spray controls including valve open time, reservoir pressure and needle stroke. Nozzles are available in a range of sizes for both round and fan patterns. [2300] (331)

ENTER 2424 FAST FAX

ISP starter kit

The ispStarter Kit, distributed by Zatek Components, is designed to make Lattice's in-system programmable (ISP) device technology available in a complete package. The kit contains the software, hardware, device samples, datasheets and information necessary to begin designing with Lattice's ISP products.

ISP is a Lattice innovation that supports device function programming and reprogramming on printed circuit boards at 5 V. It is said to accelerate the system and board level debug process and enables the user to define board layout early in the design process. Systems incorporating ISP are reconfigurable with devices already soldered to the PC board, minimising board rework time.

The ispStarter Kit supports Lattice's ispLSI 1016 device, said to be the industry's fastest high density programmable device at 110 MHz. It also supports Standard 22V10 architecture and Lattice's ISP generic digital switch for applications such as software driven hardware configuration and multiple DIP switch replacement. [690] (8897)

ENTER 2425 FAST FAX

Rechargeable battery

Maxell's nickel metalhydride rechargeable battery, available through Panapex Australia, offers high capacity of 1300 mA/h.

All constituent battery materials are inorganic resulting in longer shelf life and heavy duty 3 C continuous discharge, Panapex said. A charge time of one hour is possible when a control circuit recommended by Maxell is used. The battery's charge/discharge cycle life is more than 500. As the output voltage is 1.2 V, the same as NiCad batteries, no changes to equipment circuitry is necessary to use the battery.

The battery does not have any toxic materials such as mercury or cadmium. [130] (8098)

ENTER 2426 FAST FAX

Computer system for harsh environments

Two SealTouch computer systems for harsh environments are available from Deeco through Amtex Electronics. The two systems, one powered by a 486DX-2 at 66 MHz the other by a 486DX at 33 MHz, feature Deeco's patented SealTouch infra-red touch system.

The computers, housed in a panel mount configuration for integration into custom enclosures, are said to withstand harsh industrial environments where heat, cold, dirt and humidity are a problem. [387] (2807)

ENTER 2427 FAST FAX

Low power dc-dc converter

Alpha Kilo Services has released the NMP series low power miniature dc-dc converters from Newport Components.

Two dc-dc converters are offered in the series: the NMP0103S and the NMP0105S. At a 1 V input voltage the NMP0103S gives a 3.3 V output voltage and the NMP0105S gives 5 V output. Both accept an input voltage range from 1 to 3 V with output voltage accuracy of ±5 per cent.

The converters are suitable for low power design applications, particularly hand-held products. They have a case footprint of 31 mm^2. [1740] (4695)

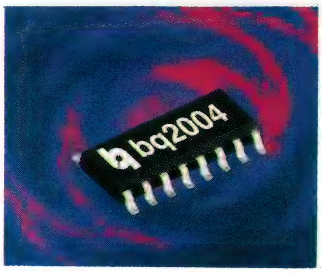
ENTER 2428 FAST FAX

Battery management fast charge IC

Benchmarq Microelectronics, distributed by DCS Australasia, has added another charge termination technique to its folio. The peak voltage detection (PVD) method used in the bq2004 fast charge IC allows two terminal (positive and negative) fast charge termination of nickel metal hydride batteries.

The compact bq2004 16 pin narrow SOIC package IC also provides modulated output to 300 kHz for switched mode current regulation, battery temperature and voltage qualification before fast charging, multiple LED display options, less than 1 mA low power standby mode and pulse trickle "top off" charge control features.

Fail safe terminations include maximum temperature, maximum charge time and maximum battery voltage. [130] (10667)



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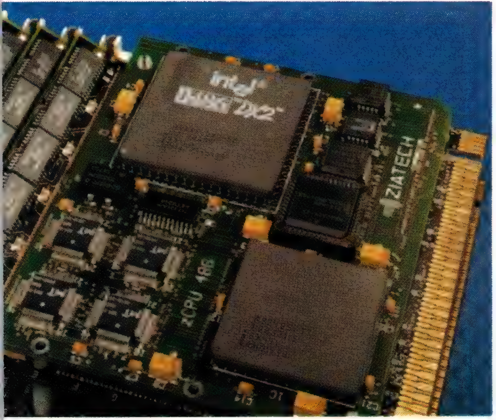

Low temperature single board computer

The Ziatech ZT89LT02 is a low temperature version of the ZT8902 STD 32 single board computer. Available through JZW Control Systems, the ZT89LT02 has an operating range of -40–70°C.

Ziatech single board computers provide PC/AT compatibility and VME level performance in a compact format. The ZT89LT02 is available with processor options ranging from the 25 MHz 486SX to the 66 MHz 486DX2. It also features 32 bit super VGA local bus video capabilities.

The PC/AT compatible ZT8902 is supported by Ziatech's industrial BIOS, Microsoft MS-DOS and Microsoft Windows. It will also run Unix, OS/2, QNX and other operating systems. [387] (9168)

ENTER 2430 FAST FAX

Power protection system

The PowerSafe power protection system from Power Tech Australia is a software support package designed to warn users of impending server shutdown.

PowerSafe will directly alert all users to a power failure and advise the system administrator and nominated users of the nature of the failure. It will write a history log file of the action taken, close any open files, log out all users and conduct an orderly shut down of the computer system before the UPS battery is depleted.

Unattended operation is also possible by configuring PowerSafe to restart the network and resume operations once the power supply is restored. Log files and electronic mail are generated to provide information regarding the events leading up to the shutdown and the restart process. The system deactivates UPS output after a shutdown to allow automatic computer restart when power is restored.

PowerSafe is said to use minimal system resources. It requires one serial port to communicate with the UPS. The software is available on DAT, quarter inch tape and DOS or TAR diskette. [2150] (4022)

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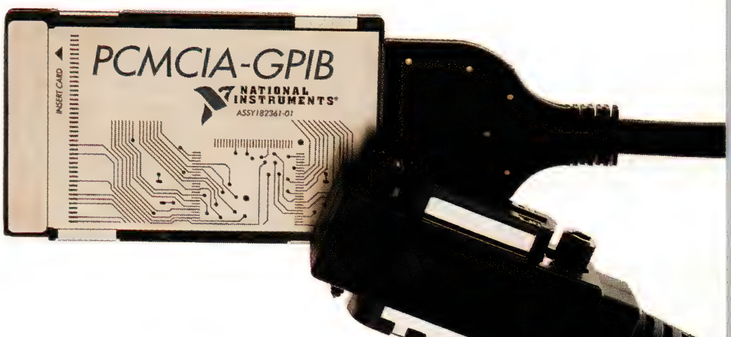

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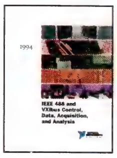
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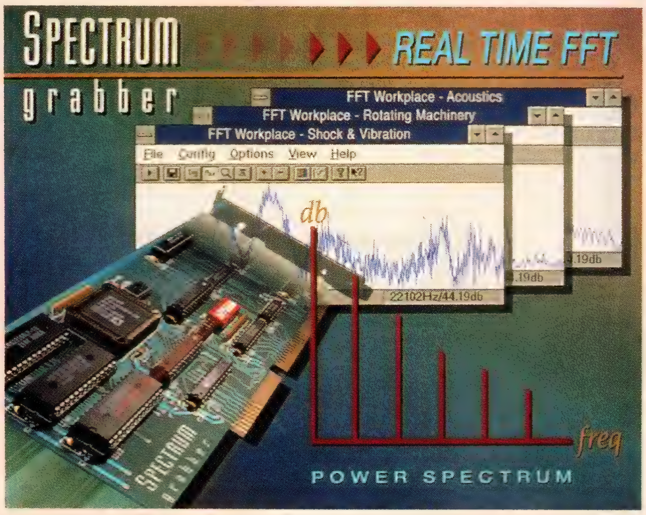
Spectrum grabber card

Dataq Instruments, represented by Scitech, has introduced the DI-280 spectrum grabber card for applications that require real time frequency analysis. The spectrum grabber is said to support any A/D or D/A card from any manufacturer through the use of a DMA listener operation.

The card may be programmed to eavesdrop on any eight or 16 bit DMA channel that is being used by an inputting A/D card or an outputting D/A card. It generates a continuous 1024 point FFT from the DMA data and makes this information available to any program.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REAL TIME FFT
FFT Workplace - Acoustics
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FFT Workplace - Shock & Vibration
File Config Options View Help
db
19db
19db
22102Hz/44.19db
freq
POWER SPECTRUM
SPECTRUM grabber

The spectrum grabber is said to provide a solution for applications in general spectrum analysis, vibration and acoustics. The product may be used in dynamic signal analysis for the isolation of mechanical noise and the characterisation of vibrating signal sources or PC-based sound systems.

The Spectrum grabber includes DOS and Windows software drivers and ready-to-go FFT Workplace software for Windows. [387] (386)

ENTER 2432 FAST FAX

Platform for fibre optic data network

The R4 system from Symbex Optical Systems is a flexible modular platform that allows many different configurations for optical data networks including self healer ring, star, point to point, electrical or optical repeaters.

The system supports most major programmable logic controls (PLCs) with plug in interfaces for Allen Bradley, GE, Square-D, Modicon, TI, Reliance and Westinghouse. These master link modules support two wire RS-485, four wire RS-485, RS-232, RS-422 and TTL with data rates to 2 Mbaud.

The R4 optical transceiver modules allow multiple optical paths to and from the network chassis. Different optical wavelengths may be mixed in the same rack. The optical transceivers extend the network point to point distances up to 22 km.

Power supply options include 115/230 V ac, 12/24 V dc and -48 V dc. Mounting options include wall/cabinet with double key slot mounting holes or 3RU 19 in (48.3 cm) rack mounts with options for one or two R4 chassis units. [1590] (11818)

ENTER 2433 FAST FAX

Motor tester

Behlman Electronics BL Series motor testers, distributed locally by Nilsen, offer "soft start" capability, allowing motors to start in locked rotor conditions.

By folding back voltage and slowly increasing it during acceleration, "soft start" avoids high input current service and restrainment of the motor during production testing. This design permits starting motors which normally require up to 140 A of starting current.

The BL Series delivers 1350 VA ac power, outputting pure sine waves during start-up, with running currents of 14 A at a 50 per cent duty cycle. They provide fully adjustable frequency and voltage, low total harmonic distortion, 85 per cent efficiency, 0.1 per cent line regulation.

Behlman testers offer overload protection, true rms digital readout of voltage and current, and remote dc programming for voltage and frequency. They require 9 cm of rack height. [1270] (910)

ENTER 2434 FAST FAX

Real-time systems software

Gensym Corporation's G2 software for intelligent real-time systems is available locally through Tech Control. The software has been released on the Microsoft Windows NT platform, adding to a range that includes UNIX and VMS platform versions.

Gensym said the G2 range represents the first real time expert system product for a PC environment with true object-oriented capabilities. Applications include process optimisation, real time quality management, supervisory control, advanced control using fuzzy logic and neural networks, process re-engineering and dynamic scheduling. [384] (250)

ENTER 2435 FAST FAX

Optoelectronic sensors

Optoelectronic sensors with glass fibre photoconductors are available from Electrocon in versions that can be used in industrial situations. Electrocon's FASOP system offers advantages such as miniaturisation, insensitivity to disturbances, temperature resistance and non-contact switching.

The system photoconductors in the FASOP system are in functions, as a one-way light barrier (passage light), tracer (reflex light) and angle (V-shaped arrangement). They are made with glass fibre photoconductors of various diameters and aperture angles. Specialised photoconductors for double and multiple reflex or multiple passage light applications are also available.

The compact amplifiers which transpose the receiving light source into a usable electronic signal feature SMD technology and operate with a modulated infra-red light (wave length 880 mm).

The analogue output, with a linear amplifier range of 0.1 to 5 V and high repeatability, is said to be suited to positioning tasks, tolerance monitoring and checking of lengths and diameters. [1590] (6110)

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The PICO Technology range are unique low cost data acquisition products for IBM PCs and compatibles. Installed in seconds, they simply plug directly into either the serial or parallel port. Each device comes with PicoScope Software (Oscilloscope, TRMS Voltmeter, Spectrum Analyser), PicoLog (Advanced Data Logging software) or both. Also includes C, Pascal and basic drivers to develop your own software.

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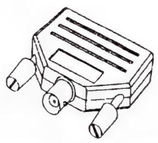

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- Up to 18kHz Sampling Rate
- Includes PicoScope Software

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- *Voltmeter*
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- *Chart Recorder Emulation*
- *Temperature Measurement*
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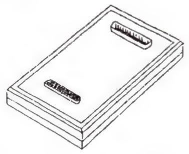
- *Chromatography*
- *Research & Teaching*

ADC-16



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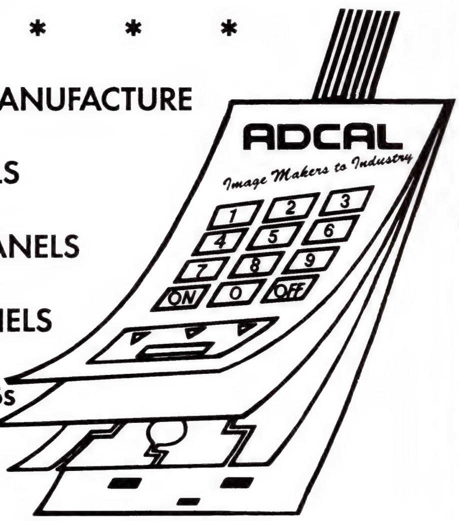

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Rack mount UPS

Online Control, supplier of power protection equipment for computer and sensitive electronic equipment, has introduced the latest range of UPS from Deltec. The Deltec range of PowerRite Pro rack mount UPSs fit in a standard 19 in (48.3 cm) rack and are ruggedised to withstand random vibrations.

The PowerRite Pro rack mount models are in power ranges from 1000 VA to 2200 VA. They have easy-to-read front panel status indicators, audible alarms, RS-232 communications interface and optional Smart LAN interface software for Novell, LAN Manager, UNIX, Macintosh and other systems.

The PowerRite Pro is supplied with microprocessor-based technology for extending battery life. Called advanced battery management, this process is said to extend the life of UPS batteries by up to 10 years. It also recharges batteries so the user will be ready for the next power outage, and alerts the user up to 60 days before the depletion of the battery.

This advancement in battery management makes the PowerRite Pro rack mount UPS suitable for applications such as automatic test equipment, process control, rack installed LANs and telecommunications. [1740] (298)

ENTER 2463 FAST FAX

Embedded computer architecture

VME Systems has available SKYchannel embedded computer architecture from SKY. By implementing the latest in bus and crossbar technologies, SKYchannel is said to double the performance of presently available architectures.

SKYchannel is a 64-bit 320 MB/s packet bus that connects compute processors, bulk memory, VME64/VSB and high speed I/O for maximum throughput. In traditional architectures, bus speeds are limited by the speed of the slowest I/O device.

The SKYchannel packet bus technology significantly simplifies and accelerates data transfers by buffering the compute processors and global memory from slower I/O devices, ensuring data transfers at the maximum 320 MB/s speed of the bus. [387] (954)

ENTER 2464 FAST FAX

Development system

The Oztechnics 68705 development system is an Australian designed, PC-based development for Motorola single chip microcontrollers.

The development system includes all the tools required to develop hardware and software applications for the 68705 microcontroller series. The tools include a programmer board, in circuit software simulator, cross assembler, programming software, demonstration routines and user manuals.

The programmer board connects to the parallel and serial ports of an IBM compatible PC. The microcontrollers are automatically programmed from the PC without requiring intermediate EPROM programming steps, Oztechnics said. The simulator board is used to test and debug 6805 code on the PC before committing it to the microcontroller's EPROM. The simulator supports in circuit simulation, allowing for all I/O processing to be performed externally by the target hardware.

The standard development system supports the 68HC705, C4/C8, J2, K1, 68705 P3/P5, U3/U5 and R3/R5 microcontrollers. An optional upgrade package, including 12 adaptor boards and an enhanced software package, adds support for the 68HC705, C8FNN, C9, D9, E1, P6/P9 and B5 microcontrollers. [390] (11837)

ENTER 2465 FAST FAX

Dissipative field service kit

Simco has just launched a dissipative field service kit that safely discharges static from any charged conductive item placed on its surface.

The kit consists of a 61 cm^2 work surface mat with two 28 cm square pockets, a ground lead and a conductive wrist strap. The mat is of durable, static dissipative vinyl with a surface resistivity of $19^9\ \Omega$ per square, preventing the generation of static charges on its surface. [2150] (11825)

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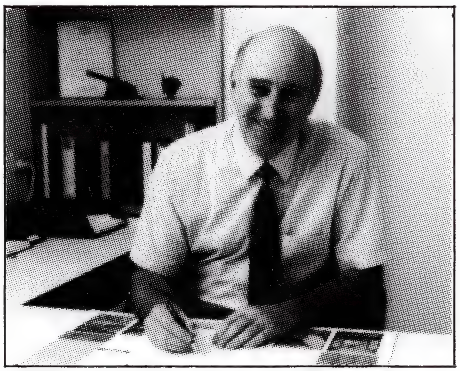
Component News

JULY 1994


Keith Anderson - Managing Director

The first half of 1994 has been a time of expanding business for many suppliers of electronic components and equipment manufacturers.

Lead times on many semiconductor items are still extended although improvements on several lines has been realised.

Passive and Connector product lead times tend to be lengthening and customers are urged to be aware of this situation.

This edition features a new supplier to Adilam, Figaro Engineering Inc., the world's foremost manufacturer of gas sensors. Also new products from Methode, Harting, Wima, NCC Matsuo and SGS-Thomson are mentioned.

The Adilam Team wishes all customers a successful second half of 1994.

P.C. Card Products

PC Card

Methode Electronics

Methode's 68-pin headers and receptacles are PCMCIA compatible.

The headers are available in straight, right angle and stacked configurations.

The receptacles are available in straddle mount and single sided mount. The independent dual beam contact design insures extended reliability.

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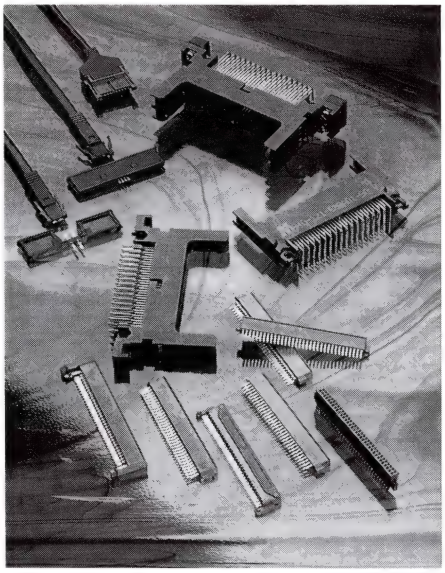

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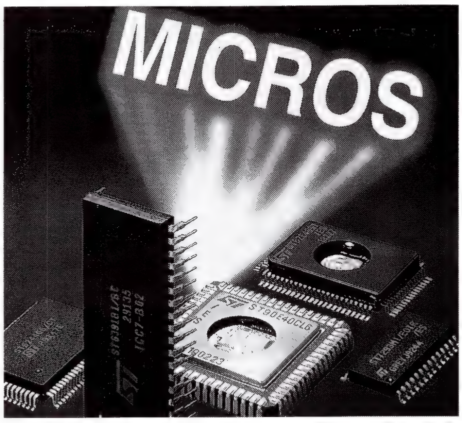

FIGARO

FIGARO Gas Sensors

Figaro Engineering is the world's leading gas sensor manufacturer.

The sensors are mainly composed of sintered tin dioxide which detects gases through an increase in electrical conductivity when the reducing gases are absorbed on the sensor's surface.

FEATURES:

- Long life and reliability
- High sensitivity
- Quick response
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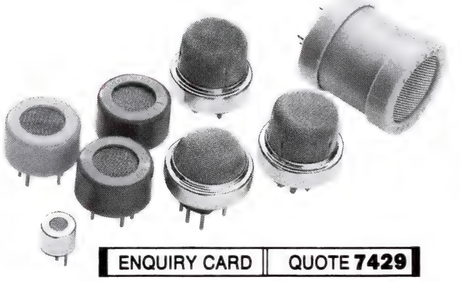

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Table - 1 Gas Sensors

Category	Model	Typical detection range	Features
Combustible gases	TGS109	LP-Gas (propane, butane) 500~10000 ppm	• 100V circuit voltage type • Large output signal • Pre-calibrated sensor modules are available (see Table-2)
	TGS109T	Natural gas 500~10000 ppm	
	TGS813 TGS816	General combustible gases 500~10000 ppm	• For various combustible gas detection • TSG816: Heat resistant type
	TGS842	Methane, Propane, Butane 500~10000 ppm	• Low sensitivity to noise gases
	TGS815	Methane 500~10000 ppm	• Small dependency on humidity and temperature
	TGS821	Hydrogen 50~1000 ppm	• High selectivity and sensitivity to hydrogen
Toxic Gases	TGS203	Carbon monoxide 50~1000 ppm	• High sensitivity and selectivity to carbon monoxide • Microprocessor and hybrid IC are available (see Table-3)
	TGS824	Ammonia 30~300 ppm	• High sensitivity to ammonia
	TGS825	Hydrogen sulphide 5~100 ppm	• High sensitivity to hydrogen sulphide
Organic solvents detection	TGS822 TGS823	Alcohol, Toluene Xylene, etc. 50~5000 ppm	• High sensitivity to alcochol and organic solvents TSG823: Heat resistant type
CFCs (Chlorofluorocarbons) HCFCs, HFCs	TGS830	R-113, R-22 100~3000 ppm	• High sensitivity to various CFCs, HCFCs • Good cross sensitivity
	TGS831	R-21, R-22 100~3000 ppm	• Quick response to R-21, R-22
	TGS832	R-134a, R-22 100~3000 ppm	• High sensitivity to R-134a and R-22 • Good cross sensitivity
Odor detection	TGS550	Sulphur compounds 0.1~10 ppm	• Ultra high sensitivity to sulphur compounds • Low power consumption • For intermittent detection
Ventilation controls	TGS100 TGS800	Air contaminants (Cigarette smoke, Gasoline vapors, etc.) Less than 10 ppm	• Highly sensitive detection of contaminants in air with microprocessors (see Table-3) • Pre-calibrated sensor modules are available (see Table-2)
Cooking controls	TGS880 TGS881	Volatile gases, Vapors from food (Gas, Humidity, Smoke, and odor)	• Total gas detection in cooking process • TSG881: Heat resistant ceramic housing
	TGS883T	Humidity, volatile gas and vapors from food	• High sensitivity to humidity

ENQUIRY CARD | QUOTE 7430

Adilam Electronics Pty Ltd
The Component Specialists

AS 3902/ISO 9002 QUALITY SYSTEM

JAS-ANZ

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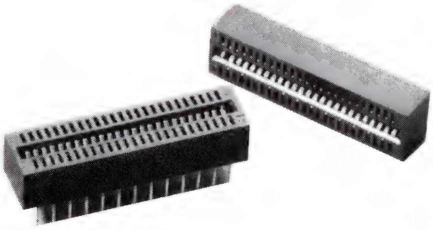


ENQUIRY CARD | QUOTE **7431**

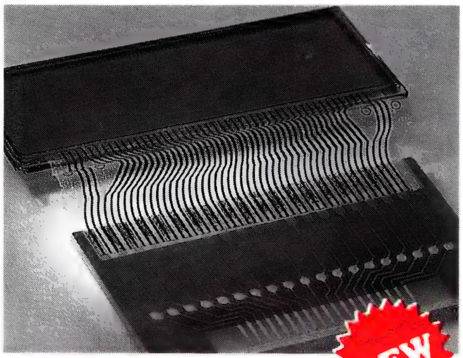
METHODE

NEW

Low Profile Card Edge Connector

.050″ (1.27mm) centre

- Available with 20, 24, 50, 60, 100, 112, 132 contacts
- Insulator profile only .320″ high for miniature applications
- Accepts standard .062″ ± .008″ daughterboard
- Available in dip solder, surface mount and card extender versions.



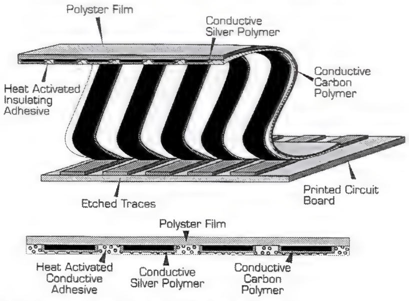
NEW

Hot Seal Connector

FEATURES:

- Capable of interconnecting to very fine pitch where mechanical connectors have reached their limitation.
- Superb dimensional flexibility offers engineers unlimited freedom to design the connectors for many applications at a higher productivity rate.
- HSC is a light, flat and high-density interconnector which can blend into the use of product miniaturization.
- Durability and flexibility are able to withstand continuous bending in "hinged" application.
- Lower process cost as one sealing operation can simultaneously interconnect a large number of terminations.

CROSS SECTION OF A HEAT SEAL CONNECTOR


Polyester Film
Conductive Silver Polymer
Conductive Carbon Polymer
Heat Activated Insulating Adhesive
Printed Circuit Board
Etched Traces
Polyester Film
Heat Activated Conductive Adhesive
Conductive Silver Polymer
Conductive Carbon Polymer

ENQUIRY CARD | QUOTE **7432**

NIPPON CHEMI-CON

The RW Series of aluminium electrolytic capacitors are for use in inverter applications.

This series features high voltage, high ripple current and long life.

ENQUIRY CARD | QUOTE **7433**

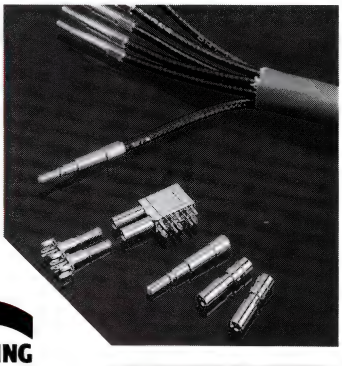
NEW

HARTING NEW PRODUCTS

har-pak® mini coax connector system

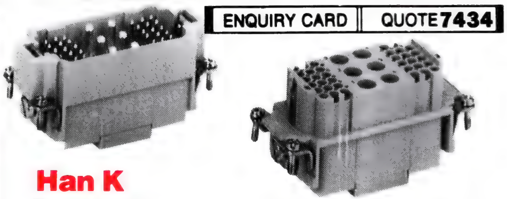
Allows transmission up to 2.5 GHz

- Standardized connector programme (IEC 1076-4-100)
- Space utilization. Realising 6 mini coax contacts in an ISU module giving space for 60 mini coax lines on a double eurocard
- LCP for connector housings listed according to UL94-V0



HARTING

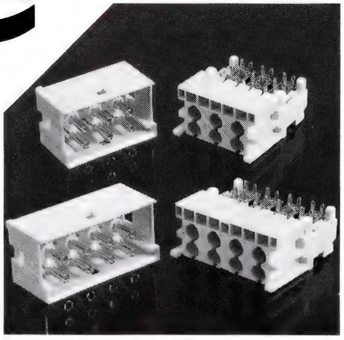
ENQUIRY CARD | QUOTE **7434**



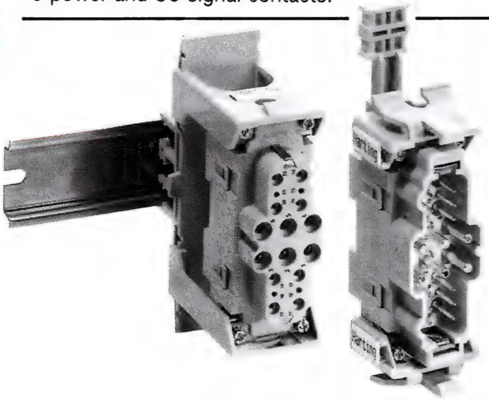
Han K

The Han K range of connectors provides both signal and power contacts in one connector. The signal contacts may be for fibre optic cables.

The latest addition is the K6/36 incorporating 6 power and 36 signal contacts.



ENQUIRY CARD | QUOTE **7435**



Han Snap

Ideal for use within closed electrical operating environments such as rooms, cabinets or termination boxes.

ADVANTAGES:

- Reduction of material and assembly costs
- Fast, easy installation
- Pre-assembly of Han cable assemblies
- Secure and rigid mounting
- Allows frequent use of latching systems

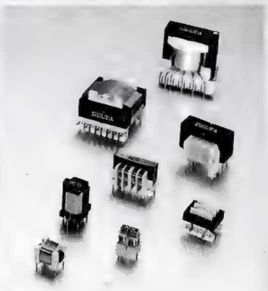
ENQUIRY CARD | QUOTE **7436**

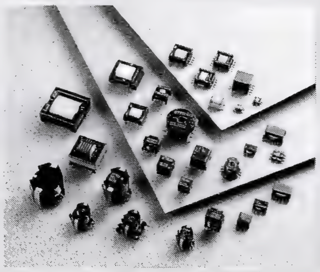
Transformers and Magnetics

Delta is the leading manufacturer of transformers and magnetics and their QA system complies with ISO 9000 standard.

Vendor awards have been received from IBM, HP, DEC, Rockwell, Epson, NCR, Xerox and many other major customers.

In addition to catalogue items high volume custom designs are welcomed.





DELTA

ENQUIRY CARD | QUOTE **7437**

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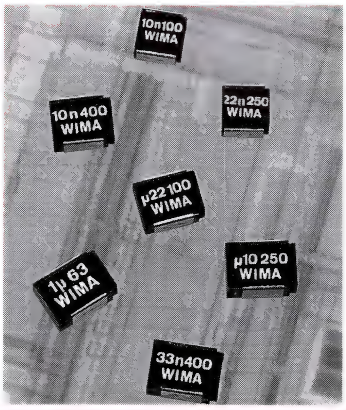
NEW SURFACE MOUNT COMPONENTS

WIMA SMD 7.3 NEW RANGES

Metallised polyester capacitors

- Capacitance range 0.01μF to 1.0μF
- Voltage range 63 to 400 VDC
- Length 7.3mm
- 'Shadow Free' soldering quality
- Ideal where stability and quality required such as timing and frequency stable oscillator circuits

ENQUIRY CARD | QUOTE 7438



Capacitance*	63 VDC/40 VAC*			100 VDC/63 VAC*			250 VDC/160 VAC*			400 VDC/200 VAC*		
	L ±0.2	W ±0.3	H ±0.2	L ±0.2	W ±0.3	H ±0.2	L ±0.2	W ±0.3	H ±0.2	L ±0.2	W ±0.3	H ±0.2
0.01 μF	**7.3**	6	2.5	**7.3**	7	3	**7.3**	7	3	**7.3**	9	3.5
0.015 „	**7.3**	6	2.5	**7.3**	7	3	**7.3**	7	3	**7.3**	10	4.5
0.022 „	**7.3**	6	2.5	**7.3**	7	3	**7.3**	7	3	**7.3**	10	4.5
0.033 „	**7.3**	6	2.5	**7.3**	7	3	**7.3**	7	3	**7.3**	10	4.5
0.047 „	**7.3**	6	2.5	**7.3**	7	3	**7.3**	9	3.5			
0.068 „	**7.3**	6	2.5	**7.3**	7	3	**7.3**	10	4.5			
0.1 μF	**7.3**	6	2.5	**7.3**	7	3	**7.3**	10	4.5			
0.15 „	**7.3**	6	2.5	**7.3**	7	3						
0.22 „	**7.3**	7	3	**7.3**	9	3.5						
0.33 „	**7.3**	9	3.5	**7.3**	10	4.5						
0.47 „	**7.3**	9	3.5	**7.3**	10	4.5						
0.68 „	**7.3**	10	4.5									
1.0 μF	**7.3**	10	4.5									

NEW

METHODE

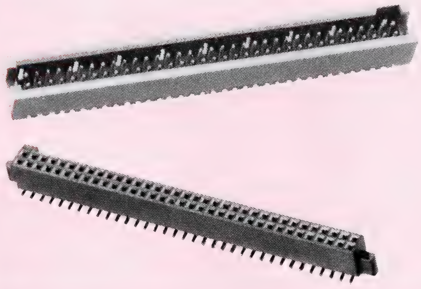
Micro Mate

Dual Row Header and Receptacle

.050″ × .050″ (1.27mm)

The 980 Series Header and 970 Series Receptacle are the latest additions to the growing range of surface mount connectors available from Methode.

ENQUIRY CARD | QUOTE 7439



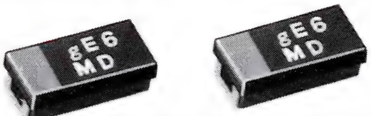
NCC Matsuo

Ultra miniature, solid tantalum Type 278

- Size: L2.0mm, W 1.25mm, T 1.2mm, Case code S
- Capacitance range: 0.47 μF to 3.3 μF
- Rated Voltage: 2.5, 4, 6.3, 10, 16 VDC

Also available Type 277

- Low profile (1.2mm)
- Capacitance range: 0.1 μF to 68 μF
- Rated voltage: 4, 6.3 10, 16, 20 VDC

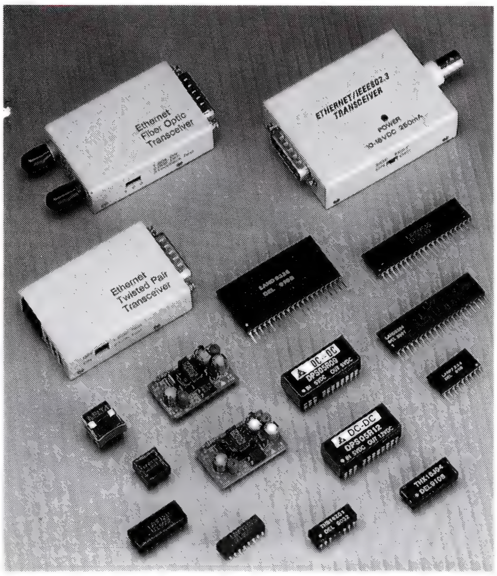


ENQUIRY CARD | QUOTE 7442

DELTA

LAN Components

- ▲ LAN transceivers for Ethernet 10base2/10base5/10base-T and Ethernet fibre optics 10base-FL/Foril
- ▲ LAN drivers
- ▲ LAN filters including Ethernet 10base-T filters, CDDI filters and fast Ethernet filters
- ▲ DC/DC converters
- ▲ Pulse transformers
- ▲ Surface mounting device to reduce size and enhance reliability
- ▲ Applicable to Arcnet, Ethernet, Token Ring and FDDI/CDDI
- ▲ OEM LAN cabling system


Ethernet Fiber Optic Transceiver
ETHERNET/IEEE802.3 TRANSCEIVER
POWER 10-16VDC 260mA
Ethernet Twisted Pair Transceiver
DC-DC
DC-DC

ENQUIRY CARD | QUOTE 7440

SGS-THOMSON MICROELECTRONICS

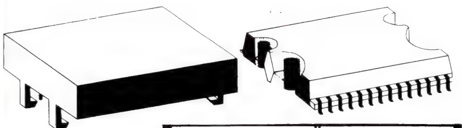
SNAPHAT

To date, non-volatile SRAMs have always been offered in DIP packages mainly because the energy cell cannot survive the high temperatures needed for solder reflow. But not anymore. Introducing SGS-THOMSON's new SNAPHAT™—the industry's first and only SOIC surface-mounted integrated battery back-up SRAM that overcomes the temperature obstacle.

SNAPHAT is offered in 2 versions of a 64K byte NV SRAM

- Memory only (M48Z18-100MH1)
- Memory with integrated Real Time Clock (M48T18-100MH1)

Larger memory densities and increased functionality units are also planned.



ENQUIRY CARD | QUOTE 7441

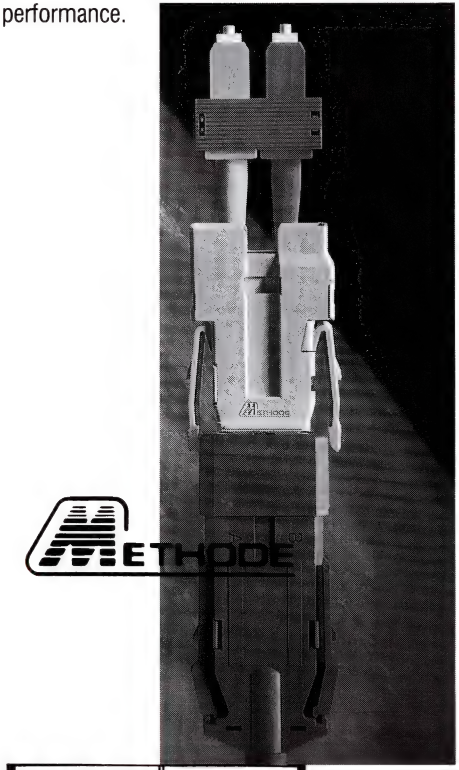
PAPST

proven technology and reliability available from Adilam

- Papst have the most extensive range of equipment fans.
- Featuring reliable, long life, trouble free operation.
- New series include the VARIOFAN–12VDC Variable Speed units and the FLATPAK, AC and DC Blower units for high static pressure.

Fibre channel compatible SC, FDDI and ESCON® duplex connection and couplings

Methode's extensive fibre optic products are designed to meet JIS, ANSI and ESCON specifications for intermateability and optical performance.



ENQUIRY CARD | QUOTE 7443

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SGS-THOMSON MICROELECTRONICS

NEW 'NA' SERIES HIGH-VOLTAGE POWER MOSFETS

NEW

NA series

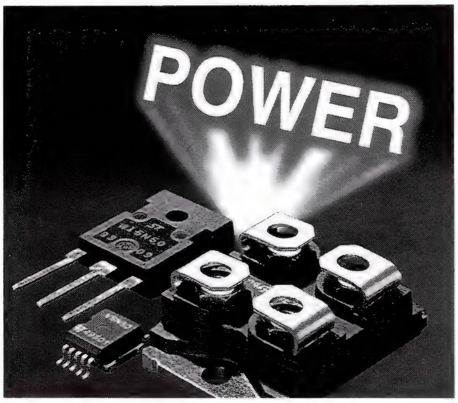
A new family of fast-switching Power MOSFETs with substantially lower gate charge, exhibit improved dynamic performance along with state-of-the-art edge termination designed for the lowest RDS(On) per unit area.

This family of 400V to 1000V devices represents the most advanced high-voltage technology.

Salestype	BVdss (V)	RDS(on) (Ω)	Id (A)	Ptot (W)	Package	Similar Part
STP7NA40	400	1.00	6.5	100	TO-220	IRF730
STP7NA40FI	400	1.00	3.8	35	ISOWATT220	IRF730FI
STP10NA40	400	0.55	10.0	125	TO-220	IRF740
STP10NA40FI	400	0.55	5.5	40	ISOWATT220	IRF740FI
STP5NA50	500	1.60	4.5	100	TO-220	IRF830*
STP5NA50FI	500	1.60	3.0	100	ISOWATT220	IRF830FI*
STP6NA50	500	1.10	6.1	100	TO-220	STP6N50
STP6NA50FI	500	1.10	3.6	35	ISOWATT220	STP6N50FI
STP8NA50	500	0.85	8.0	125	TO-220	IRF840
STP8NA50FI	500	0.85	4.5	40	ISOWATT220	IRF840FI
STP4NA60	600	2.20	4.4	100	TO-220	IRFBC30
STP4NA60FI	600	2.20	2.6	35	ISOWATT220	STP3N60FI
STP5NA60	600	1.60	5.1	100	TO-220	STP5N60
STP5NA60FI	600	1.60	3.0	35	ISOWATT220	STP5N60FI
STP6NA60	600	1.20	6.5	125	TO-220	MTP6N60
STP6NA60FI	600	1.20	3.7	40	ISOWATT220	MTP6N60FI
STP7NA60	600	1.00	7.2	125	TO-220	NEW !
STP7NA60FI	600	1.00	4.0	40	ISOWATT220	NEW !
STH8NA60	600	1.00	7.9	150	TO-218	NEW !
STH8NA60FI	600	1.00	5.0	60	ISOWATT218	NEW !
STP3NA80	800	4.00	3.2	100	TO-220	BUZ80
STP3NA80FI	800	4.00	1.9	35	ISOWATT220	BUZ80FI
STP4NA80	800	3.00	3.7	100	TO-220	BUZ80A
STP4NA80FI	800	3.00	2.2	35	ISOWATT220	BUZ80AFI
STP5NA80	800	2.40	4.8	125	TO-220	STP5N80*
STP5NA80FI	800	2.40	2.7	40	ISOWATT220	STP5N80FI*
STH6NA80	800	2.40	5.3	150	TO-218	STHV82*
STH6NA80FI	800	2.40	3.5	60	ISOWATT218	STHV82*

** Indicates that RDS(on) is slightly higher*

ENQUIRY CARD | **QUOTE 7446**



Power

Number one in the world for smart power, number 3 in the world for discrete power you can count on SGS-THOMSON to meet all your power needs from thyristors and triacs, through bipolar power transistors and powerMOS to the very latest in smart power ICs.

Starter kit for home automation applications

The Home Automation Starter Kit simplifies the design of power line communications applications.

Included in the kit are a ready-to-use evaluation board, power supply, cables and source code for communications software that minimizes the time taken to complete an application.

Also includes all the hardware necessary to implement a power line communications interface; the SGS-THOMSON ST7537 power line modem IC, an ST9 microcontroller that implements the communications protocol, an RS232 interface and a wire-wrap area where additional hardware can be added.

ENQUIRY CARD | **QUOTE 7444**

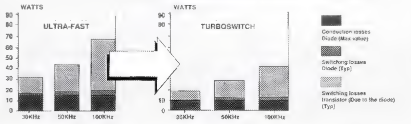
TURBOSWITCH Series

A NEW STEP TOWARDS POWER LOSSES FREE DIODES

The TURBOSWITCH High Voltage Rectifiers are born from a drastic improvement of the Conduction and Switching behaviours. It upgrades system global efficiency in any switching applications operating at high voltage (600V to 1200V) such as SMPS, UPS and Motor Control.

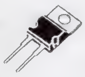
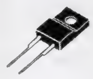
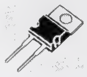
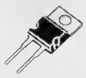
In addition, the extremely fast characteristics (A series) allow high frequency operation and the soft switching performance of B series allows noise-free operation.

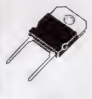
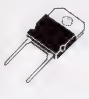
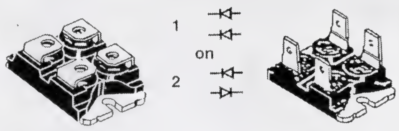
EXAMPLE IN A POWER FACTOR CORRECTION CIRCUIT
At 100kHz, for a 8A 600V diode, the overall power losses will decrease from 88 to 40 Watts



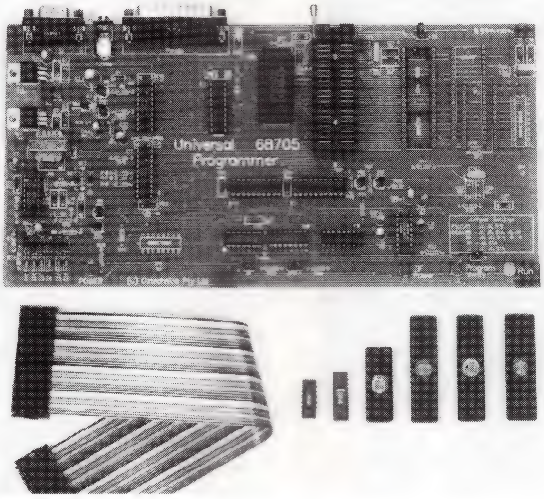
ENQUIRY CARD | **QUOTE 7445**

PRODUCT RANGES

I_0 (A)	1.5	3.5	5		8		12	
CASE V_{RRM} (V)	SOD6	SOD15	 TO220AC	 ISOWATT220AC	 TO220AC	DO2201	 TO220AC	DO2201
600	STTA106U	STTA306S	STTA506D	STTA506F	STTA806D	STTA806DI	STTA1206D	STTA1206DI
	STTB106U	STTB306S	STTB506D	STTB506F	STTB806D	STTB806DI	STTB1206D	STTB1206DI
1200	STTA112U	STTA312S	STTA512D	STTA512F	STTA812D	STTA812DI	STTA1212D	STTA1212DI

I_0 (A)	20		30		60		120	
CASE V_{RRM} (V)	 SOD93	DOP31	 SOD93	DOP31	 ISOTOP: SCREW VERSION (V) OR ISOTOP: FAST-ON VERSION			
600	STTA2006P	STTA2006PI	STTA3006P	STTA3006PI	STTA6006T(V)1	STTA6006T(V)2	STTA12006T(V)1	STTA12006T(V)2
	STTB2006P	STTB2006PI	STTB3006P	STTB3006PI	STTB6006T(V)1	STTB6006T(V)2	STTB12006T(V)1	STTB12006T(V)2
1200	STTA2012P	STTA2012PI	STTA3012P	STTA3012PI	STTA6012T(V)1	STTA6012T(V)2	STTA12012T(V)1	STTA12012T(V)2

Development system for microcontrollers



The Oztechnics 68705 Development System is an Australian designed, PC based development system for Motorola 68705 single chip microcontrollers.

The development system consists of a programmer board, an in circuit software simulator, a cross assembler, programming software, demonstration routines and a user manual. It supports 68HC705 C4/C8, J2, K1, 68705 P3/P5, U3/U5 and R3/R5 microcontrollers.

The programmer board connects to the parallel and serial ports of an IBM compatible PC. Microcontrollers are automatically programmed from the PC without requiring intermediate EPROM programming steps.

The simulator is used to test and debug 6805 code on the PC before committing it to the microcontrollers EPROM. The simulator also supports in circuit simulation which allows all I/O processing to be performed externally by target hardware.

An optional upgrade package, consisting of 12 adaptor boards and an enhanced software package, will add support for the 68HC705 C8FNN, C9, D9, E1, P6/P9 and B5 micro controllers. [387] (11837)

ENTER 2437 FAST FAX

Vehicle monitoring system

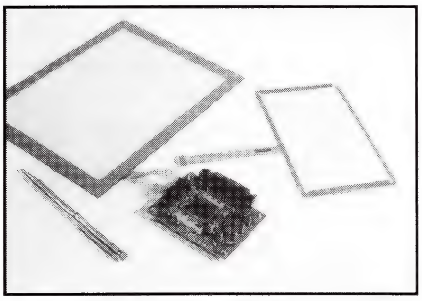
Vehicle Systems Australia has released a product called the Vehicle System, an electronic vehicle monitoring system.

The Vehicle System uses sensors attached to key vehicle functions to record data relating to vehicle usage. Features include automatic data transfers from the vehicle to any DOS compatible computer, automatic identification of drivers and trailers, a continuous temperature audit for all loads carried and load cell monitoring.

The system is made up of four basic components: a driver handset and data recorder for each vehicle, a small protective interface to the electronics system of each vehicles, specialised sensors for monitoring vehicle functions and a software management package to process and analyse collected data. [388] (11838)

ENTER 2438 FAST FAX

DMC
ANALOGUE TOUCH PANEL



DMC is offering stock touch panels to its customers. You may use any size display in conjunction with our stock touch panels. There is no need for tooling and delivery time, so you save both time and money.

Sizes available

- 154 x 95 mm
- 260 x 130 mm
- 260 x 174 mm
- 260 x 200 mm

CATALOGUE AVAILABLE FROM

Jesec switches-plus

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C&K Electronics Sydney
Ph: (02) 635 0799 Fax: (02) 633 9137

Agents:
LE Boughen Brisbane
Ph: (07) 369 1277 Fax: (07) 368 3193
Prospec Distributors Perth
Ph: (09) 362 5011 Fax: (09) 361 9592
CL Burton Adelaide
Ph: (08) 293 8955 Fax: (08) 293 8903
George Harvey Tasmania
Ph: (003) 31 6533 (002) 34 2233

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ALL-07 UNIVERSAL PROGRAMMER

Affordable, Professional Programming Instrument with On-Going Support up to 256 Pin Devices - Converts to a Four or Eight Gang Production Programmer in seconds EPROMS (16K-8M), PLDs, Bi-polars, MPUs, Flash and more

TRADE-IN your tired old hack machine now and solve all your Programming Problems

PS - Lots of low cost, refurbished trade-in units also available

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Bayswater, VIC 3153

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Fax 03-720-5268

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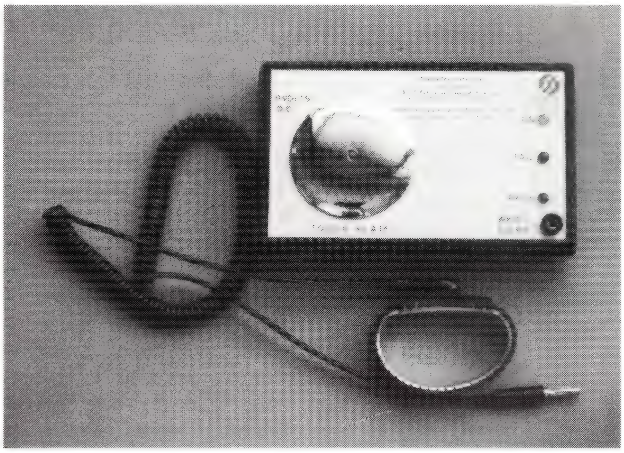

Static tester

The Model 9000 static tester from Solder Static is an Australian designed testing unit for wrist strap and foot grounders.

The 9000 plugs into the wrist cord socket of a wrist band. The operator, while wearing the wrist band, then touches the unit's touch plate. This will give a pass or fail result, indicated by two LEDs.

The 9000 is designed to give test results for a range between 0.9 MΩ and 5.5 MΩ. It is powered by a remote low voltage supply which is included with the unit. [2150] (9209)

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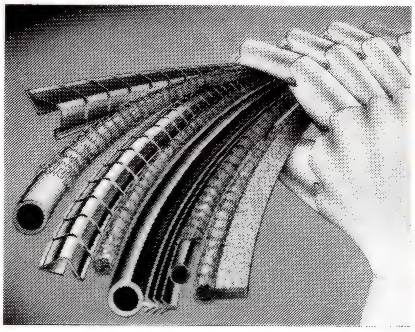

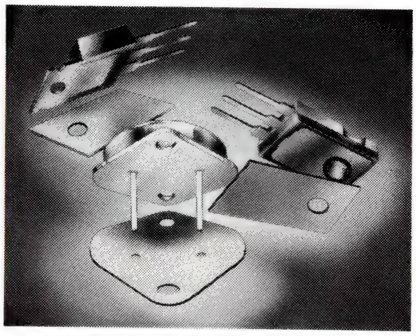

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Device programmer and tester

Sunshine, through local distributor Nucleus Computer Services, has just released the Power 100, a universal device programmer and tester with a built in power supply and PC printer port connection.

The Power 100 offers a 48 pin textool as standard, a full range of adaptors to cover a wide range of packages, up to 8 gang programming for production use, rapid programming (27C256 in 6 s) and support for over 1500 devices.

Software self definition and source code of self diagnosis are provided so that customers can use the Power 100 on their own devices. This is said to make the programmer suitable for ASIC devices. The Power 100 can handle up to 256 pin devices should it become necessary in the future. [387] (10853)

ENTER 2440 FAST FAX

PC/104 accessories

Applied Computer Research and Engineering (ACORE), a division of OSItech, has released two PC/104 accessories: a test kit and module removal tool kit.

The accessories are said to be suitable for designers using the PC/104 standard to satisfy the reduced space and power constraints of embedded control applications, while retaining full hardware and software compatibility with the PC bus standard.

The PC/104 test kit, which converts a PC/104 bus to ISA-Bus, has been designed to allow full testing and development of PC/104 modules on ISA-Bus systems.

The module removal tool kit permits quick and easy removal of PC/104 modules without the risk of bending pins, ACORE said. [1270] (10976)

ENTER 2441 FAST FAX

High voltage amplifier

Warburton Franki has introduced the new Krohn Hite model 7600 power amplifier. The 7600 delivers 17 W rms to 500 kHz and 10 W to 1 MHz. The design uses hybrid CMOS power technology.

The 7600's 141 V rms output, low-distortion and ability to drive capacitive loads are said to make it suitable for applications such as driving piezo electric transducers, ion beam deflection, biochemistry stimulation, ink jet testing and meter calibration.

Other features include ±200 V variable dc offset, selectable gains to 42 dB, common mode rejection of 80 dB and ac or dc input coupling. A meter that is selectable to display heat sink temperature in °C, output peak voltage or average output current is also included. [811] (254)

ENTER 2442 FAST FAX

SCSI-2 controller

The ZT8955 controller from Ziatech, available locally through JZW Control Systems, allows system designers to use up to seven SCSI-2 peripherals in an STD 32-based control system.

The ZT8955 supports the Fast-SCSI subset of the SCSI-2 specification, allowing a peak data rate of 10 Mb/s on the SCSI bus. Software support for the ZT8955 is supplied in two different forms: as a BIOS extension and as a DOS-installable driver. [387] (9168)

ENTER 2443 FAST FAX

GPS-RF trouble shooter kit

GPSat Systems has released the GPS-RF trouble shooter kit.

The GPS-RF kit compares up to four GPS receivers under static or dynamic conditions, allowing the user to establish position accuracy and tracking performance.

The kit consists of a single four-port splitter for the GPS navigational signals, inter-series coaxial adaptors, a dc power block and a set of matched cables. The four-port splitter has an input frequency range of 1.2 to 1.6 GHz, typical interport isolation of 20 dB and maximum phase/amplitude unbalances of 5° and 0.5 dB respectively. [1270] (10852)

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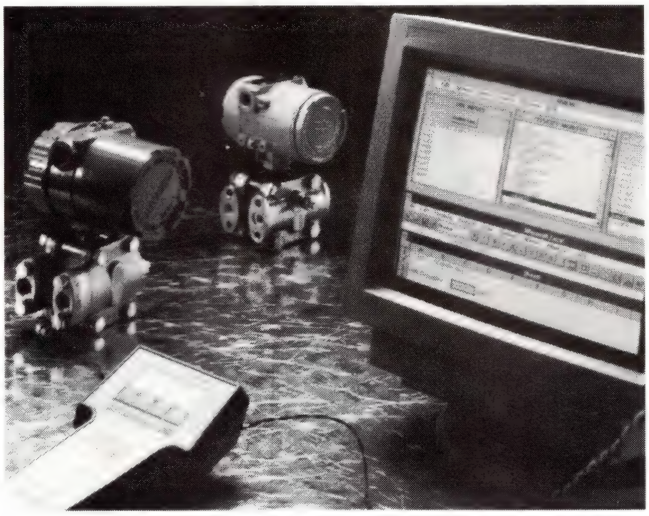
Communications software package

Arcom Control Systems, distributed locally by Backplane Systems Technology, has launched a Windows communications software package which allows users to exploit the digital capabilities of process transmitters and other devices compatible with the HART field bus standard. Called H-VIEW, the package is said to provide a powerful suite of interface and management functions.



H-VIEW enables the user to configure networks of HART devices, to interactively communicate and modify device characteristics, to test and run diagnostics and to monitor process activity. The package consists of a HART management system layered on a real-time communications resource. Its capabilities can be grouped into four main function areas: plant commissioning, plant maintenance, data acquisition and network management.

H-VIEW can communicate with up to 992 devices and is said to automatically poll the system on demand to determine type and number of devices connected. It uses this information to construct and maintain a graphical map of network topology. Full time DDE and DLL compatibility allows these data to be exported in real-time to other Windows applications such as spreadsheets, databases and data acquisition packages. [384] (5905)

ENTER 2445 FAST FAX

Electronic tagging system

Electronic identification equipment manufacturer Integrated Silicon Design has introduced the Model 4000 System for mass market tagging applications.

The Model 4000 system is targeted to applications where large numbers of tags are required such as parcel identification, document control, material tracking, manufacturing control and warehousing applications. Various models are available with read ranges from 150 mm to 1 m. Conveyor belt style readers are available that can identify objects travelling at speeds up to 2 m/s.

The tags can be encapsulated to customer's specifications. Standard tags are proximity programmable and are of a standard credit card size (72 x 40 x 4 mm). Tag shape and size may be varied to a degree based upon customer applications or requirements. High temperature tags (200°C+) are also available. [1600] (5463)

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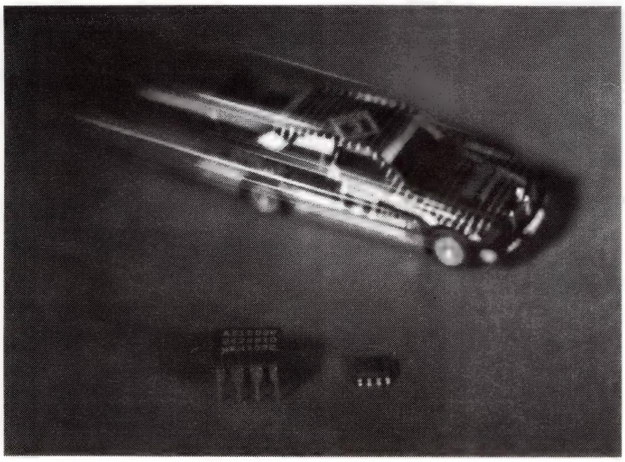

Voltage regulator and watchdog

Dice Technologies has released the A6150 voltage regulator and watchdog from EM Microelectronic-Marin. The A6150 combines voltage regulation, voltage monitoring and software monitoring in an eight lead package.

The A6150 has a ground current of 175µA, a dropout voltage of 300 mV and an operating input voltage up to 26 V. Input protection includes load dump and reverse battery.

System security is improved by a watchdog function that monitors software cycle time and execution. A system enable output also prevents motor controls being energised on repeat resets of a faulty system.

The A6150 is supplied in DIP8 and SO8 packages with operating temperature range of -40 to 85°C. Applications include automotive electronics, cellular telephones, air conditioning systems and alarm systems. [1740] (15)

ENTER 2447 FAST FAX

Digital resolver

The Size 11 digital resolver from Clifton Precision, distributed by Litton, is a compact angular position transducer with dc input and digital output. The Size 11, a brushless resolver, includes electronics that allow it to operate as an absolute encoder.

Compared to an encoder, the brushless resolver is said to be more rugged with superior accuracy and resolution. It has low sensitivity to variations in voltage, and performs under conditions of extreme temperature, humidity, shock and vibration, Litton said.

The brushless resolver is suitable for situations where precise position data are required for computer input. Some typical applications include position and velocity sensing, brushless dc servo commutation, robotics and factory automation, CNC machine tools, material handling and medical devices. [387] (4165)

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Ring style force sensors

PCB Piezotronics, distributed locally by MB & KJ Davidson, has released the Series 201 piezoelectric ring style force sensors. Used in manufacturing processes to monitor dynamic forces, the quartz force rings are said to be suitable for compression/tension press monitoring, balancing, forming, fatigue testing, predictive maintenance and quality control.

Eleven sensor designs are available for incorporation into controlled laboratory or harsh, permanent mount factory environments. Long signal discharge time constants are available for quasi-static operation.

PCB's ICP microelectronic amplifier is incorporated into each design. This allows for the conversion of the high impedance voltage signal without the need for additional charge amplifiers. The amplifier output voltage signal is said not to be affected by triboelectric noise or other contaminates and can be transmitted across long cables without loss of signal.

The series 201 sensors are welded and hermetically sealed. [840] (406)

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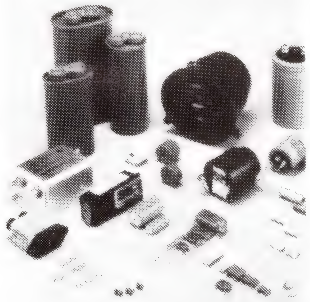

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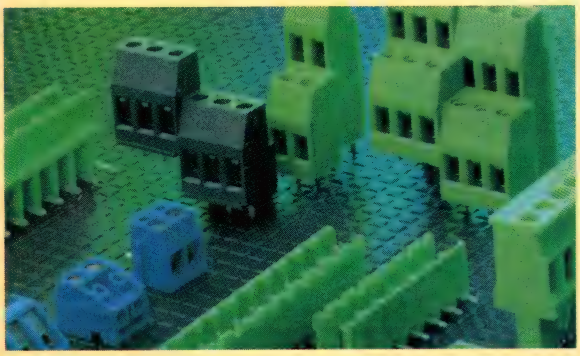

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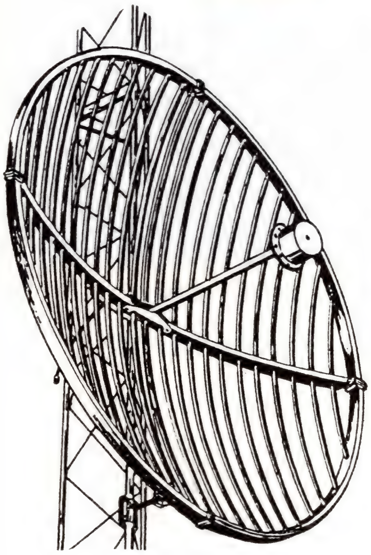

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Hand-held PCM bit error rate tester

Marconi Instruments has launched a hand-held PCM bit error rate tester (BERT) for in service and out service testing of 32 channel systems. The 2840 2 Mb/s transmission analyser is said to feature performance test and diagnostic capabilities that are usually only found in larger and more expensive instruments.

All the required functionality for network testing is provided in the hand-held unit. The 2840 features a combined pattern generator and error detector providing 2.084 Mb/s framed and unframed testing. Comprehensive storage is provided allowing eight sets of test results to be stored in addition to 10 user defined instrument set-ups. A powerful print to RAM capacity allows up to 10,000 events to be stored for later printing and analysis.

The 2840 includes a large back-lit LCD with a zoom feature that allows selected results to be expanded for in-depth analysis. An RS232 port is also provided for remote unattended configuration and downloading of results.

The unit has a battery life of eight hours with a recharge time of only two hours from a mains or vehicle supply. [1270] (5396)

ENTER 2450 FAST FAX

PC battery holder

Keystone Electronics, represented by Nylon Products Australasia, has produced a snap in PC mount battery holder for 1/2 AA size cylindrical batteries.

The battery holder has snap fit PC contacts that hold it in place during wave soldering. The contacts are made of spring steel that is duplex nickel plated for contact reliability and solderability.

A snap on ABS tamper proof retainer cover is optional. The cover protects the battery from shock, vibration and shorting. The holder measures 16.4 x 39 mm and is made with 30 per cent glass filled nylon. [130] (922)

ENTER 2451 FAST FAX

Data capture recorders

Astro-Med, distributed by Metromatics, has released the 4 channel DASH IV and 8 channel DASH 8 data capture recorders.

Some of the features the Dash recorders offer include data capture with 256 KB RAM per channel, stackable data records and archival capability to floppy disk. They have eight hour operation from internal rechargeable batteries, 300 dot per in (2.54 cm) amplitude resolution and built in differential inputs that accept ac or dc signals from 50 mV to 250 V.

Plug in modules are available that allow the user to carry out thermocouple, high voltage, current or dc bridge measurements. [388] (1024)

ENTER 2452 FAST FAX

Programmable ac sources

Hewlett Packard has added four models of programmable ac sources to its existing family of power products. The new HP 6800 ac power source/analysers combine stimulus, measurement and analysis functionality in a single compact package.

The HP 6800s, the first ac sources developed with 16 bit measurement capability, are said to provide a solution for all single-phase and three-phase ac power applications. They feature output levels up to 3000 VA (single phase models) and 1500 VA per phase on three-phase models. Low distor-

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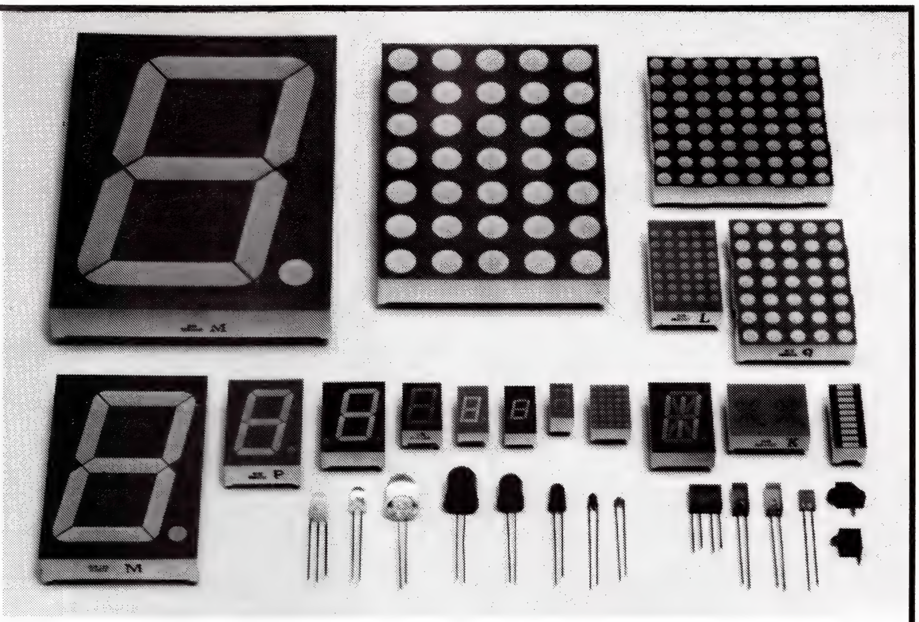

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NEW PRODUCTS

Telecomms test set

Schlumberger has launched a range of portable telecommunications test sets that provide a solution to the installation and maintenance problems generated as PDH networks evolve into SDH transmission networks, says local distributor Wedgetail.

Called THEMIS, the range comprises analysers with instrumentation that can be configured for SDH network testing, for PDH network testing or for any combination of the two. Consistent user interface across all test applications is said to simplify the training of installation and maintenance staff as a network changes.

Unlike other telecommunications analysers, THEMIS has an open VMEbus based architecture. This provides the modularity and flexibility required to ensure that future testing functions can be integrated as needed, Wedgetail said. [1270] (11409)

ENTER 2453 FAST FAX

tion sine and square waveforms are generated to deliver clean power to any devices being tested.

The setup of the HP 6800s' built in measurement and analysis functions is simplified as measurements can be internally synchronised with output changes. [1740] (22)

ENTER 2454 FAST FAX

GaAs microprocessor

Vitesse Semiconductor Corporation, distributed locally by Logic 4, has released a gallium arsenide (GaAs) microprocessor, said to be the first commercially available. The single chip A series mainframe processor (SCAMP) is the result of a joint venture between Unisys and Vitesse.

The GaAs SCAMP, implemented as a single-chip Vitesse FX200K gate array, is said to offer twice the performance of similar BiCMOS or sub-micron CMOS designs. It is a basic architecture processor containing ALU, datapath, memory and specialised structures for specific A-Series micro code.

The SCAMP contains over 100,000 utilised transistors including 2500 bits of on-chip memory. [387] (11037)

ENTER 2455 FAST FAX

Power and harmonics meter

AWA Distribution has available the Fluke model 40 and model 41 power and harmonics meters.

The hand-held meter features a super twist and a LC graphics display making it suited for electrical distributions trouble shooting, AWA Distribution said. Supplied with a current probe, the meter will measure and display ac and dc voltages and currents (true RMS), kW, kVA power factor, displacement power factor, frequency, phase angle and crest factor. Additionally it will perform harmonic analysis on voltage, currents or watts.

Measurements can be displayed in waveform, bar graph or numeric value. [1270] (3071)

ENTER 2456 FAST FAX

SMT solder environmental kit

Electronic Development Sales now distributes Kit 4 from ESP, an SMT solder environmental kit to evaluate flux systems that do not require CFCs or other solvents for flux residue removal.

The kit is supplied with four dispensing barrels each prepackaged with 35 g of solder paste, moulded dispensing tips and a reusable hand dispenser. Sn62 and Sn63 solder paste alloys are included with both

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a water washable flux residue and a no clean flux that yields a clear, hard, non-corrosive residue. The kit also contains a barrel of prepackaged water-washable flux for rework testing.

Using the no-drip HP dispenser, precise amounts of solder paste alloy and flux can be deposited for experimental use when alternative means of residue cleaning are being evaluated. [2300] (4170)

ENTER 2457 FAST FAX

Electromagnetic simulator for Sun SPARC

Compact Software, represented locally by Step Electronics, has released the Microwave Explorer 2.0 electromagnetic (EM) simulator on the Sun SPARC station platform. This release is said to feature simulation enhancements that increase analysis speed and improve the visualisation capabilities for current distribution.

Microwave Explorer is an EM simulator for MMIC and high frequency hybrid applications. It is said to combine a geometry editor, a simulation engine and a graphical simulation output facility to provide an accurate characterisation of EM coupling in high frequency designs.

Microwave Explorer's polygon editor is said to allow quick entry to complex design geometries. The graphical simulation output facility provides current visual capabilities and flexible frequency response plots, allowing potential problems to be identified and corrected. [384] (9652)

ENTER 2458 FAST FAX

Fibre optic power meters

The 4500 series fibre optic power meters from TestcomData are said to simplify the process of turning up, testing and maintaining fibre optic links.

Designed for field technicians, the 4500 Series is an all-in-one test solution, the company said. A single connector eliminates repeated connections to the same link when performing bi-directional end to end loss tests. The testers also incorporate a message exchange capability to enable communication between users across a fibre optic link. [311] (11859)

ENTER 2459 FAST FAX

Lightning protected RS232/422 converter

Automation & Process Control (APC) has upgraded its fully isolated RS-232 to RS-422/485 converter to include transient protection as standard on the RS-422 line transceivers. Similar protection can be provided on the RS-232 buffers.

RS-232/422 converters are typically used to transmit serial data over extended distances, often requiring the RS-422 cable to become exposed to the elements. This in turn increases the chances of high transient currents appearing on the lines through lightning proximity.

To limit the risk of damage to the converter or connected equipment, high speed transient suppressors that can absorb 1.5 kW for 1 m/s are installed on the RS-422 lines, while suppressors capable of absorbing 600 W for 1 m/s are installed on the RS-232 lines.

This protection is said to extend the life of units used in high risk areas and provide extra protection to associated send/receive devices. [2150] (3983)

ENTER 2460 FAST FAX

CAD software

John Walker Graphics has released two new CAD software packages, AutoSET Draftsman and AutoSET Complete. The two individually combine the various modules that made up earlier versions of the AutoSET range of software.

The entry level product is AutoSET Draftsman which combines the AutoSET monochrome and colour software modules. The AutoSET Complete includes the monochrome, colour, colour separations and post script file editor modules.

The AutoSET modules give the user control over line widths, filling of objects in colour or grey scale, layer ordering, font selection and scaling. Both packages have identical processing power. They are supplied with 35 on screen fonts plus AutoSET postscript pattern fills.

The created files can be sent to laser printers, imagesetters at 2000+ DPI or film recorders. They can also be imported into DTP software for publication. The user can also preview AutoSET PostScript files and print them to any Windows printer. [393] (11839)

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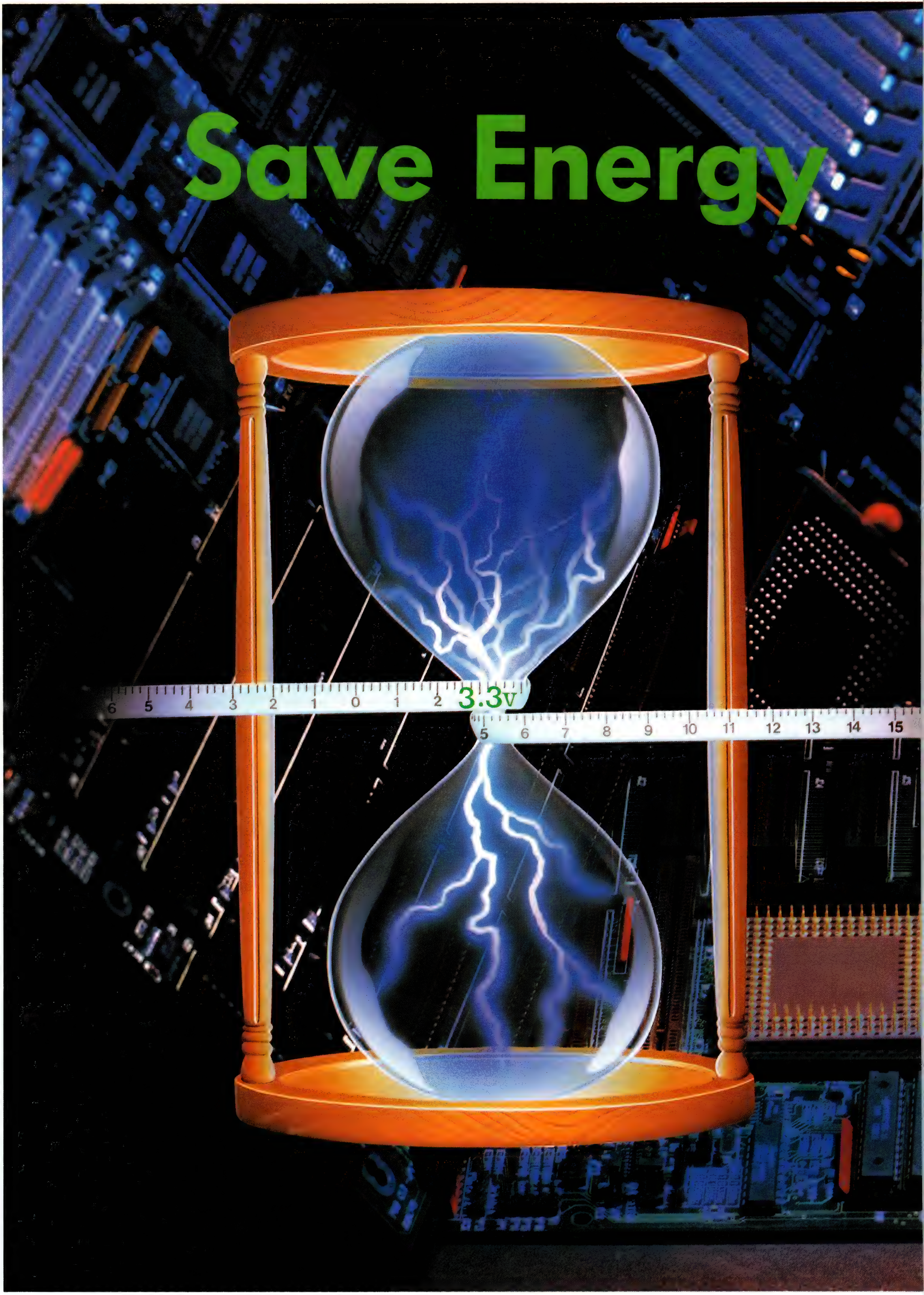

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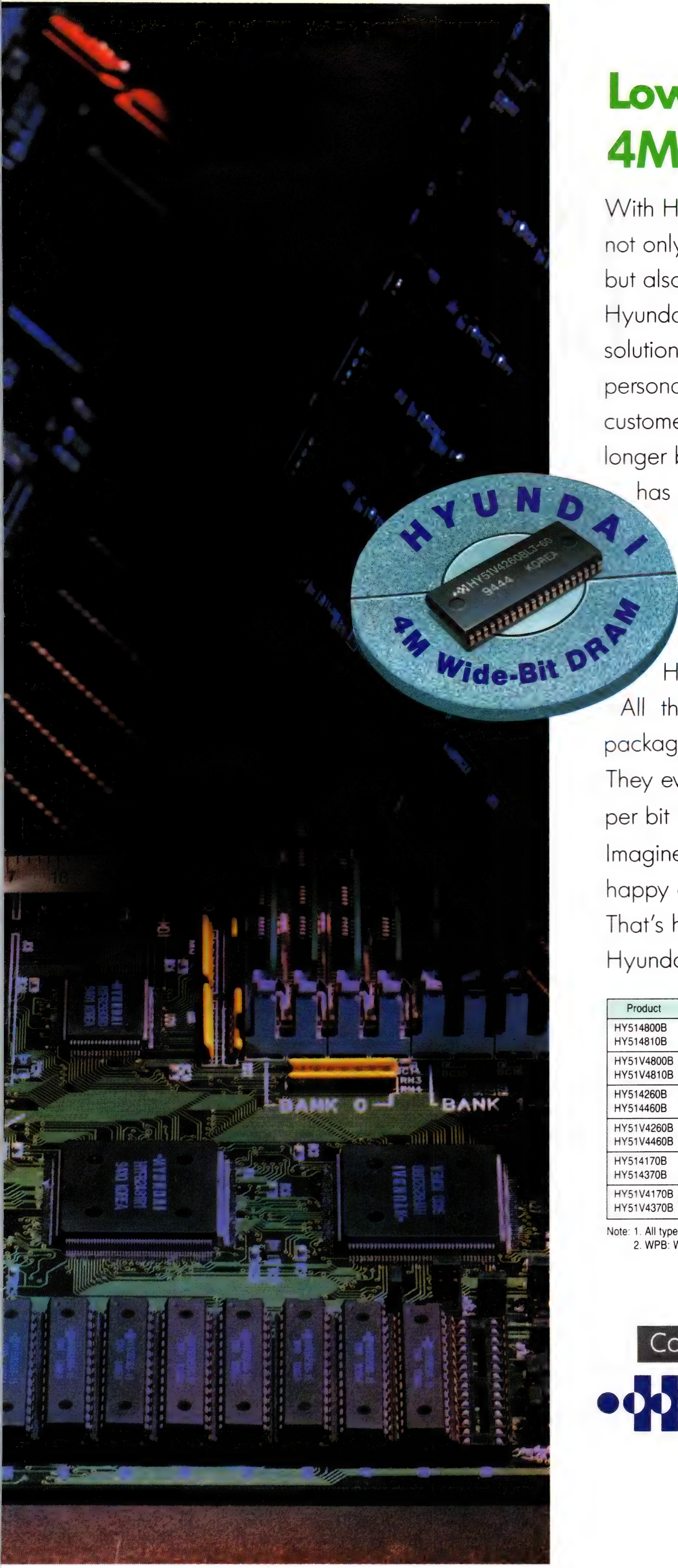

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Putting portability on board

Highly reliable high-density rigid flex printed wiring boards (PWBs) can take the weight off portable electronic equipment.

Rigid flex printed wiring boards, until now, were mainly in satellite and aircraft applications where smaller dimensions, lighter weights, and greater reliability were sought.

With the rigid flex structure, connectors are not needed, so electronic equipment can become more compact, making the rigid flex PWB suitable for present generation PCs, portable telephones and other portable electronic equipment requiring compact, lighter weight, and slimmer profiles.

But conventional rigid flex PWBs are manufactured in small lots and are therefore expensive. Density improvements through refinement of the printed pattern and reduction of through-hole diameters have not been achieved.

Table 1 shows the specifications of a rigid flex PWB. Eight rigid wiring boards are directly connected to seven flexible PWBs to form a unified system. The flexible part is then bent so the whole board can be accommodated in the limited space inside the electronic equipment. These rigid flex PWBs have the following features:

- Compact, lightweight and slim. When rigid flex PWBs are not used, rigid PWBs are connected to flexible PWBs using normal connectors. As the connectors take up valuable space, there are limits on how compact, lightweight, and slim the equipment can be.

Some products are also manufactured without connectors by soldering the flexible printed wiring board directly to the rigid printed wiring board. These need space for the pads for soldering on the surface of the rigid PWB, also placing limitations on size, weight and slimness.

In contrast, as the cross-section of the structure in *Figure 1* shows, the circuits on the rigid boards of rigid flex PWBs are connected to the circuits on the flexible boards by plating the through holes, eliminating connectors and reducing the volume and weight. Because the through holes can be positioned anywhere on the rigid part, space for connections is also not needed.

- High reliability. When connectors are used or when flexible PWBs are soldered directly to the rigid boards, the reliability of the solder itself must also be taken into consideration. Particularly when pursuing higher mounting densities, the reliability of the soldering may present problems when connecting using a fine pitch.

In the rigid flex PWB, reliability is enhanced because the unified structure eliminates soldering.

Item		Specification
Layers		6 (Flexible two-layer through hole)
Lines/space		150/150 µm
Min through-hole diameter		0.3 mm
Min QFP pad pitch		0.5 mm
Surface finish		Heatproof pre-flux
Board thickness		1.0 mm
Materials	Flexible board	Polyimide
	Rigid board	Glass epoxy
	Bonding sheet	Polyimide pre-impregnated

Table 1. Example specifications of rigid flex PWB.

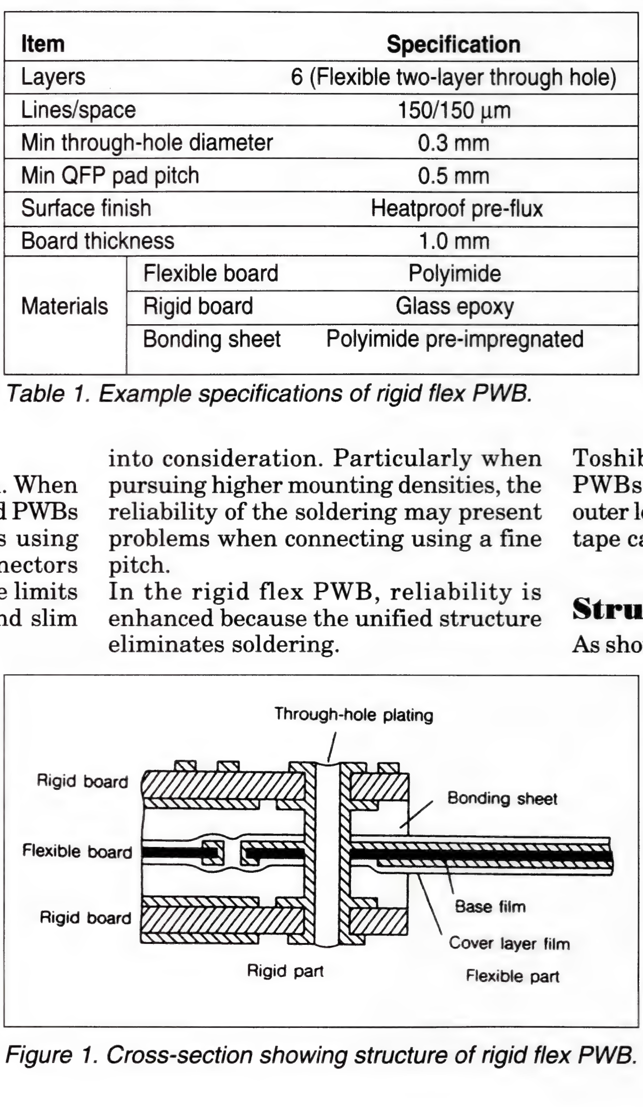

Figure 1. Cross-section showing structure of rigid flex PWB.

- Rationalised assembly. As shown in *Figure 1* the rigid flex PWB can be treated as a single printed wiring board. Similar to mounting components on a single rigid board, parts can be mounted on multiple rigid boards and the flexible boards used to connect them, greatly reducing the number of steps in assembly. Additionally, the smaller number of PWBs allows management by the supply and production departments, further rationalising the handling of the boards.
- Improved design freedom. Because space for connectors and soldering is not needed on the surface of the rigid PWBs, there are fewer restrictions on the layout of components. Further, because it is not necessary to lead the wiring through such spaces, the through holes for connecting the rigid and flexible boards can be positioned wherever needed, greatly improving design freedom.
- High-density design. As shown in *Table 1*, it is possible to design high-density PWBs using six-layer boards with a fine line/space pattern of 150/150 µm, 0.3 mm diameter via holes, and 0.5 mm pitch QFP surface mounting.

Toshiba has also developed rigid flex PWBs with eight layers designed for outer lead bonding (OLB) of 0.3 mm pitch tape carrier packages (TCPs).

Structure and materials

As shown in *Figure 1*, the rigid flex PWB is composed of the following three elements:

Flexible board. The flexible board normally consists of a three layer base of polyimide film to which copper foil is glued with adhesive. The copper circuit is then protected by a cover film of the same material (adhesive-coated polyimide film). Because the adhesive cannot be easily drilled, and therefore leads to a drop in reliability of the through holes, adhesive must be avoided where possible.

A two-layer base structure

has been used in which the copper foil and polyimide resin are glued directly to each other. Flexible boards can be made as single-sided boards, double-sided boards, or double-sided boards with through holes. In the case of the double-sided through-hole boards, interstitial via holes (IVHs) give an extremely high density.

Rigid board. The rigid board consists of a glass-epoxy laminate. In the case of six-layer boards, double-sided boards are used. In the case of eight-layer boards, two three-layer boards and one double-sided board are used.

Bonding sheet. The bonding sheet bonds the flexible and rigid boards to each other. Formerly, acrylic bonding sheets were the norm. Now epoxy and polyimide bonding sheets are more common because acrylic bonding sheets have a high thermal expansion across the thickness of the board, reducing the reliability of the through holes which are also difficult to machine.

Toshiba uses pre-impregnated glass-reinforced epoxy-resin and pre-impregnated polyimide to improve machinability and the reliability of the through holes.

Through-hole reliability

As with normal PWBs, reliability of plating of the through holes in rigid flex PWBs is important. This is because they pass through a number of different materials.

Figure 2 shows the stress generated as a result of thermal stress across the thickness of the board, and how heating affects the through-hole plating. The thermal expansion of the copper plating differs from the base resin, resulting in stress across its thickness when the board is heated.

Each time an electronic switch is operated, heat generated by the components is applied to the PWB. Also, during flow and reflow soldering, PWBs are subjected to high temperatures. The thermal shock may cause the through-hole plating to crack.

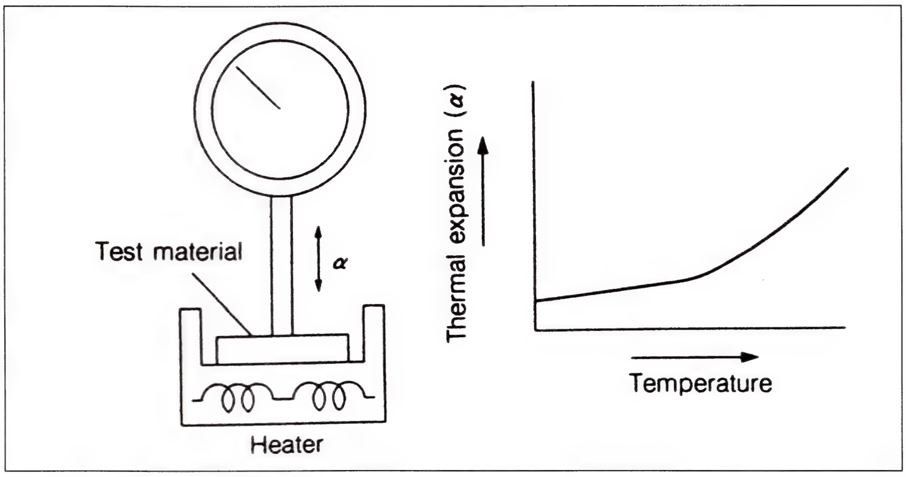

Figure 3. Overview of TMA.

The through-hole plating is also subjected to cyclical thermal stress. The life of the through-hole plating is said to depend on the fatigue caused by this thermal stress. Thermal expansion is perhaps the most important factor affecting the reliability of PWBs.

No	Adhesive used in flexible board	Bonding sheet	Glass-epoxy laminations
1	Epoxy system	Acrylic system	0.2 mm thick x 2
2	Epoxy system	Polyimide pre-impregnated	0.2 mm thick x 2
3	None	Polyimide pre-impregnated	0.2 mm thick x 2

Table 2. Structure of test board.

Thermal mechanical analysis (TMA) was used to measure the thermal expansion across the rigid flex PWB thickness.

Figure 3 shows the TMA process, in which a test piece is mounted on a heater and a probe connected directly to the test piece. Thermal expansion of the PWB causes the probe to move, and any change in the thickness of the test piece can therefore be detected as an electrical signal.

The temperature range of measurements was 23 to 250°C. The temperature was increased at a rate of 5°C/min. From the point of thermal expansion, the adhesive layers including the bonding sheet are particularly important. Most adhesives show a high level of thermal expansion and it is therefore essential to find the optimum adhesives.

Table 2 shows the three structural types of six-layer rigid flex boards that were tested.

Figure 4 shows the results of TMA. The board with the acrylic bonding sheet (No 1) demonstrated the largest thermal expansion. Except for the bonding sheet, No 1 and No 2 consisted of the same materials. Thus, we can be sure it was the acrylic bonding sheet that showed the high level of thermal expansion.

No 3, which did not use adhesives, had the lowest rate of thermal expansion. These results show acrylic bonding sheets should be avoided and the adhesives in the flexible boards should be minimised to reduce thermal expansion across the thickness of the board and so improve the reliability of the through holes.

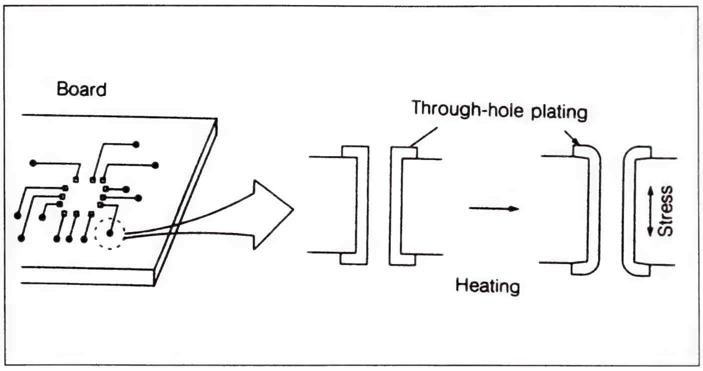

Figure 2. Thermal expansion of PWB.

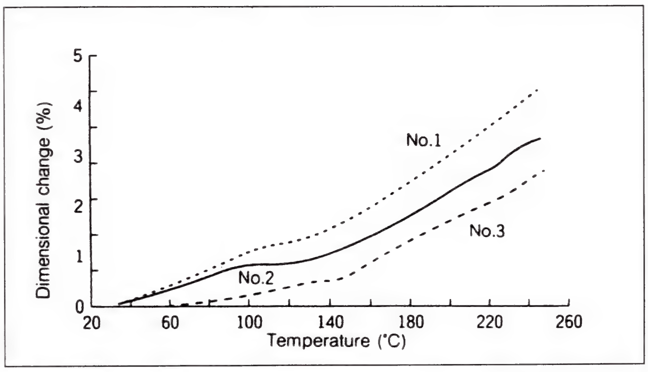

Figure 4. Result of TMA measurement (1).

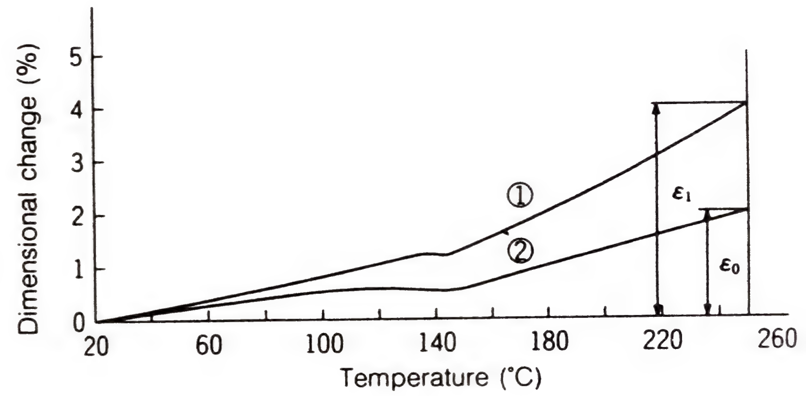

Figure 5. Result of TMA measurement (2).

Cycles		100	150	200	300	700
Percent change (%)	No 2	-0.7	∞	∞	∞	∞
	No 3	-0.7	-0.4	-0.2	0.2	-0.3

Table 3. Thermal shock test results.

The stress on the through holes from heat expansion using TMA was measured. *Figure 5* shows the elongation of the through holes during heating. Curve 1 is for the part of the through hole with no plating, while curve 2 is the result of TMA measurements of the through-hole plating.

The expansion of the material is constrained by the copper plating and the rate of dimensional change is reduced by $\Sigma_1 - \Sigma_0$ in *Figure 4.* Thus it could be confirmed that thermal expansion of the base material across the thickness of the board is constrained by the plating of the through holes, with the result that the through-hole plating is stressed.

Thermal shock testing (thermal cycle tests) was carried out to confirm that the results of TMA measurements of thermal expansion matched the evaluation of through-hole reliability in rigid flex PWBs.

Each cycle consisted of 30 minutes at -65°C followed by 30 minutes at 125°C. The electrical resistance was measured each 50 cycles for samples two and three in *Table 2. Table 3* shows the results of the tests. There was a change in resistance after 150 cycles in sample two but no change in sample three even after 700 cycles. [1790] (6957) ☐

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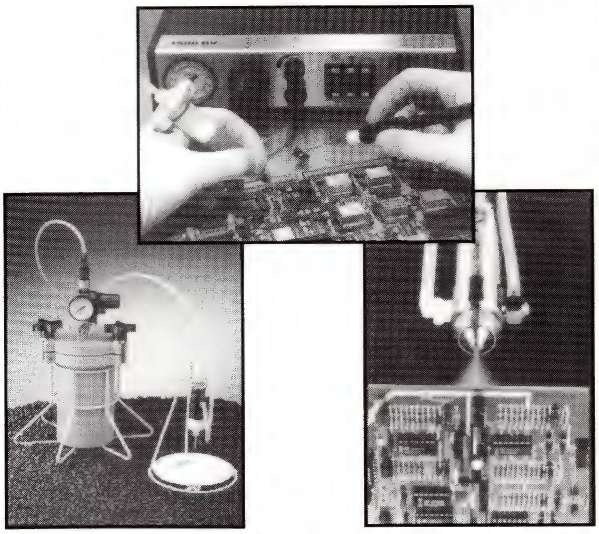

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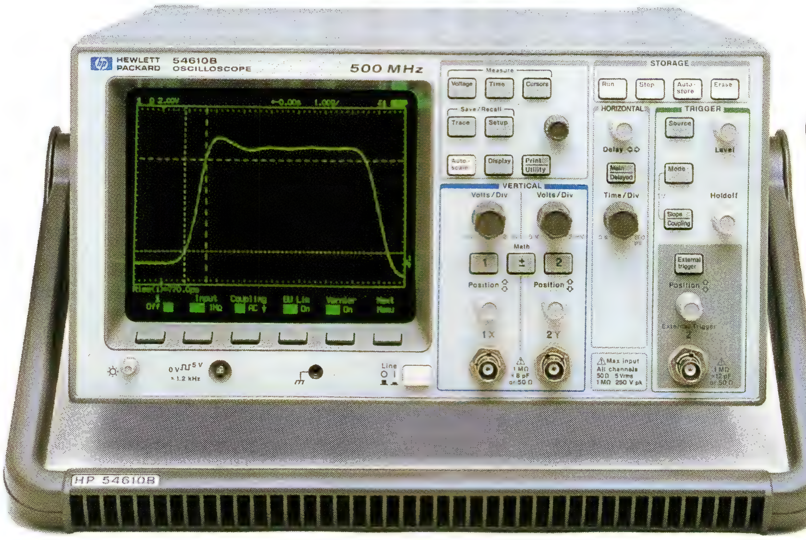

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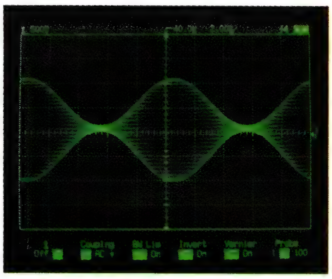

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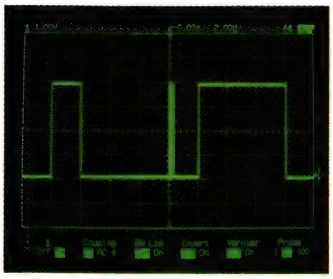

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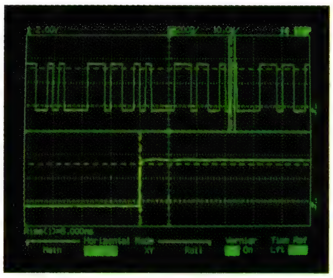

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Facing up to the green idyll

Manufacturers look set to broaden their horizons as ISO prepares standards to protect the environment. *Ross Gow* examines the impact these standards may have on companies and discovers that common sense cuts costs.

When it eventuates, certification to the International Standards Organisation's (ISO) environmental management standards will not only satisfy environmental regulators, it will give companies a market-place advantage through customer confidence. Recycling, waste management and energy conservation programs no longer will be implemented through an obligation to the law or 'green' ideals, they will be driven into action through the desire to maintain a competitive edge.

TC207 is the name of the ISO technical committee writing standards for environmental management. Six sub committees and several work groups are piecing together information and guidelines in environmental management, environmental auditing, environmental labelling, environmental performance evaluation and life cycle analysis. The proposed deadline for completion of the standards is the end of next year.

"TC207 looks exclusively at the management of environmental concerns," explains John Owen, TC207 representative and Standard Australia's group manager of Materials and Quality in charge of QR11, the combined Australian and New Zealand environmental management committee.

"The standards TC207 produces won't be setting any limits in terms of which chemicals can be used and what discharges are allowable," Owen says, "those aspects of environmental control will still be monitored by the local authorities or the Environment Protection Authority, depending on which State of Australia you're in.

"All TC207 will do," he continues, "is outline what is required to operate a successful environmental management system. The areas it will cover include a company's environmental policy, the effectiveness of its organisational structure and, of course, its ability to meet legal requirements. It will also present guidelines to assist companies that want to implement environmental management systems."

Environmental management emerged as an area for concern during the creation of standards for quality management. ISO established the Strategic Action Group on the Environment (SAGE) as an afterthought to the quality management standards, its purpose being to determine if a technical committee was required to address the environmental management issue.

The findings SAGE came up with fell strongly in favour of the establishment of a committee. The group even started documenting some of the concerns it felt should be included. As the number of nations represented in SAGE was low, there was a call for more formalised action so that all nations could have a chance to participate in the decisions being made. The TC207 technical committee was subsequently formed.

Impact of TC207

Vice president of process engineering for Texan printed circuit board manufacturer, H-R Industries, and TC207 committee member Gary Roper was in Australia last month for an ISO TC207 technical committee meeting in Surfers Paradise. As a representative of US organisation IPC (the Institute for Interconnecting and Packaging Electronics Circuits), Roper is concerned that not enough manufacturers are aware of the impact environmental standards are likely to have.

"It's almost an economic necessity to meet ISO standards these days," says Roper, "it allows you to perform at your best in a competitive market-place. The companies that will have their business affected by these forthcoming standards need to think about how they would like the registration scheme to be structured." Roper's concerns are amplified by the short deadline TC207 has set for the completion of the standards.

"Normally an ISO technical committee takes five to eight years to produce a completed standard once a work item is initiated," he says. "In the case of TC207, two of the sub committees plan to have standards ready in under a year and a half. I suggest if people want to have a say in these matters, they should do it now or be lumbered with the outcome in two years time."

Roper says TC207 has already earmarked the environmental management documents as ISO 14000 documents, their structure being very similar to the quality management ISO 9000 documents. Just as a quality system that meets ISO 9000 has to be verified by a third party, ISO 14000 standards will need to be audited by an environmental auditor.

Roper says he has "already heard talk of a possible situation emerging in a few years time where re-registering for 9000 quality standards will mean you have to register for the 14000s as well. Nothing is official at this stage, but there is a definite possibility things could go that way." The impact of the 14000 standards also depends on how much emphasis the regulatory authorities place on ISO certification.

John Owen explains: "ISO certification will enable a company to demonstrate to the relevant authorities that they have a suitable system in place to manage their environmental concerns; this will give the regulatory authorities confidence that the company is doing the right thing. It may decide that an ISO approved environmental management system is an acceptable way of meeting regulatory requirements. That will give the TC207 standards a certain amount of authority."

Cost advantages

While environmental management may initially seem just another cost manufacturers will be forced to squeeze into their budget, in practise it has proven an effective way of cutting costs.

Gary Roper's company successfully achieved significant cuts to its production costs through a successful waste minimisation program. This is another reason why Roper encourages manufacturers to look into environmental management.

"Waste minimisation is an important part of our environmental responsibilities," Roper says, "they take it very seriously in the United States. When we started implementing programs we were surprised to find they gave us a competitive edge — they actually ended up saving us money rather than costing us money."

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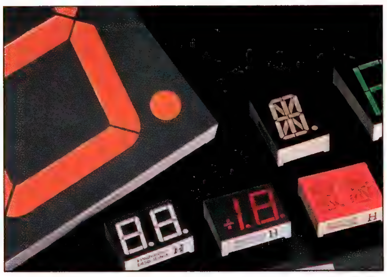

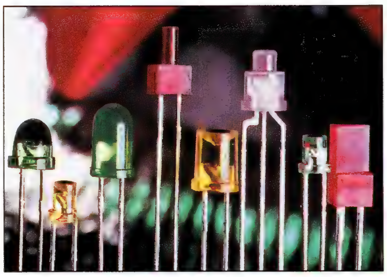

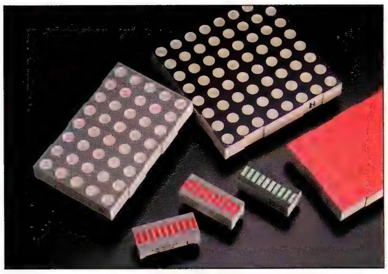

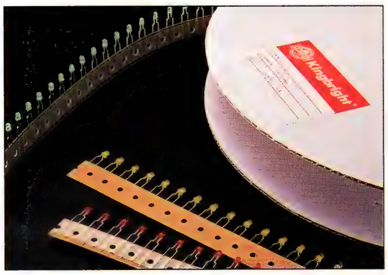

program reduced the cost of materials, disposal, utilities and labour. The longest payback period the company suffered was from a water recycling project that took three months to cover a $50,000 investment.

Similar cases can be drawn upon locally. Philips Traffic And Engineering Systems received an award from Prospect Electricity recently for a successful energy conservation project that has so far saved the company $338,200 a year.

Joseph Baraya, site engineer manager for Philips Traffic And Engineering Systems, streamlined the air conditioning system, the electricity management system, operating systems, insulation and waste problems, to reduce the company's electricity bill. The cost of the project was $658,000 but the annual saving, which is close to half that amount, shows it was worthwhile.

"You need a methodical process to approach the problem," Baraya says, "and proof that you can follow through. When you have a company as big as Philips, you can't just go to someone and say 'give me $200,000, I guarantee it will save you money'. You have to have evidence of any savings up front and it will probably be audited."

Baraya emphasises the importance of putting together a study case.

"Regardless of how much you spend on a study case it should be considered a blessing. At the end of the day you'll have a report and solutions that you will gain from forever. My savings improve by a 15 per cent minimum every year. Of course that will taper within five years, but by then we should have moved on to more advanced energy conserving methods."

Fresh attitude

To John Owen, Australian manufacturing industry attitudes towards environmental management have become noticeably positive, particularly over the past 12 months.

"We tried to implement a British environmental management standard in 1992 called BS7750," Owen explains. "We wanted to pick it up as an interim standard so that manufacturers and the Government could get an idea of what was happening overseas. Unfortunately at that stage Australian industry wasn't ready for that sort of shock — they opposed it in the hope it would just go away."

Since then, Owen says he has noticed a vast change in attitudes towards environmental management. "It was encouraging to see heavy industry representation at the meetings we recently hosted in Queensland and the degree to which Australia has been involved in recent TC207 activities around the world."

"Many companies have realised that environmental management is not something that is going to go away," Owen says, "and they seem to respect the fact that it's an activity that has to be handled properly."

Companies seeking more information about TC207 should contact Standard Australia's information centre on (02) 746 4700 in Sydney or (03) 693 3500 in Melbourne. A draft copy of the TC207 standards will be available for comment in coming months. □

PCB manufacturers: pioneers in environmental management

Six PCB manufacturers and/or assemblers tell Australian Electronics Engineering about the methods they have used to eliminate CFCs from the production process and comment on how the problem has affected their attitudes towards environmental management.

A 1992 review of the Montreal Protocol On Substances That Deplete The Ozone Layer called for the phasing out of four harmful solvents by December 1995. The announcement had a significant impact on the printed circuit board industry as one of the solvents targeted, CFC-113, was widely used for cleaning boards in the PCB manufacturing process. Through the decision of the Montreal protocol, the PCB manufacturing industry was thrown into the deep end of the environmental management issue.

So how have local manufacturers dealt with the problem?

IBM Australia

The IBM manufacturing plant at Wangaratta in Victoria was one of the first IBM plants world-wide to eliminate CFCs from the manufacturing process. The company is said to have achieved this in 1990 by implementing a process that applies a water soluble paste to boards before they are populated with components. The boards are cleaned with de-ionised water by an Electrovert surface mount aqueous cleaner.

The World Environment Centre recognised IBM's enthusiasm in tackling the CFC problem by awarding the company in 1990 a Gold Medal for International Corporate Environmental Achievement. IBM international headquarters passed the award on to the staff at Wangaratta in appreciation of their efforts.

HarTec Manufacturing

HarTec Manufacturing, known as LSE Manufacturing until recently, implemented a no clean flux method in 1990. General manager Alan Carter said the company chose the method for its cleanliness and efficiency. By eliminating the cost of CFCs from production, the company saved money — enough to pay back the changeover investment within a few months, Carter said. "HarTec has a company statement that says we will be an environmentally friendly manufacturer," Carter explained. "When the ISO standards come in, HarTec will definitely be applying for certification. I think it's a great idea."

Morris Productions

Morris Productions manufactures and supplies bare boards to PCB assemblers. Being responsible for an early stage of PCB production, the company has never had to clean boards and therefore has never used CFCs. Its production process still involves over 50 different chemical compounds, all of which are subjected to heavy regulation. Morris Productions' chief executive George Edwards said the company was very aware of environmental concerns and over a two year period he predicted it would invest over $500,000 on environmental compliance.

"We consider meeting environmental regulations to be extremely important for two reasons," Edwards said. "Firstly, we believe it to be our environmental responsibility; secondly, we predict that our clients in the future, particularly the large electronics companies, will require full environmental compliance from their suppliers otherwise they won't be viewed as reliable."

Edwards said Morris already had the AS3901 quality standard in all its operations and would apply for certification as soon as an environmental management extension was available.

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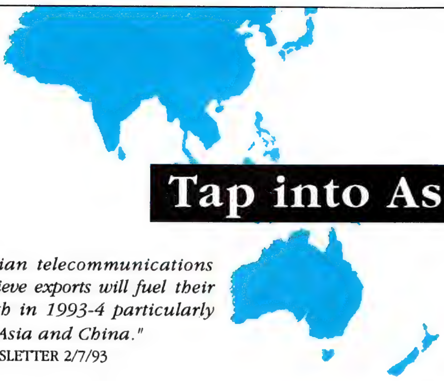
Continued on page 66



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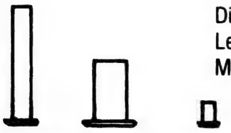

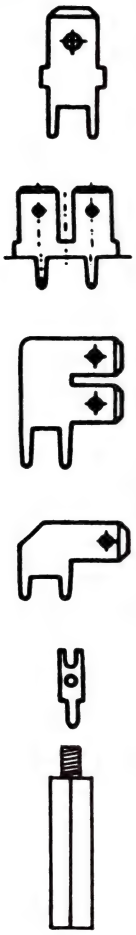

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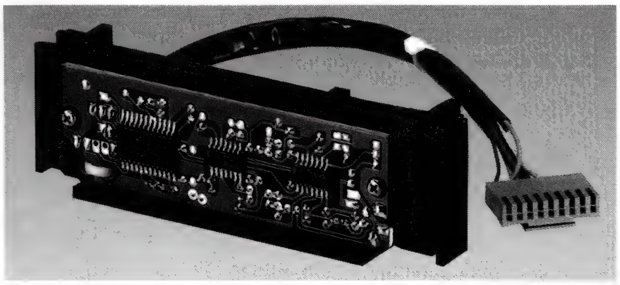

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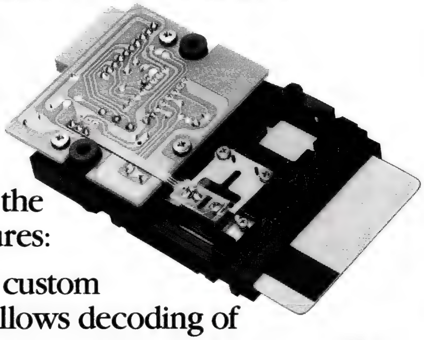

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From page 64

boards a day at its Sydney production facility in Villawood, NSW. The company eliminated CFCs from the production process by gradually introducing a no clean method before 1992.

Manufacturing engineering manager for Exicom's production facility Jan Waszczuk designed a system focused around a precise and highly uniform flux application technique. Waszczuk designed and built some of the equipment, his efforts prompting Telecom to award the company a Supplier Award for Environmentally Conscious Technology.

Although the cost of materials and machinery maintenance has dropped, Waszczuk said the company did not look at the problem from a cost saving point of view. "We saw it as an environmental and quality requirement."

"I am very keen to get involved with the ISO standards," said Waszczuk, "I actually think they are too late, something like this should have been done 20 years ago. I also think any ideas that could help the situation should be shared around the industry. We all breathe the same air, we will all benefit from good solutions, particularly the future generations."

Ericsson

Ericsson was among the first companies in Australia to choose a new solution to clean PCBs. After evaluating a number of methods the company decided to use a low solids flux before soldering. This allowed for the elimination of CFCs from the cleaning process.

The solution selected was relatively new and unproven in Australia at the time, although it had been successfully tried by other Ericsson companies overseas. The only drawback, Ericsson said, was that the use of the new flux required different solder machine settings. However, eliminating the cleaning process resulted in some savings.

Alcatel

Alcatel's printed circuit board manufacturing facility at Liverpool operates 24 hours a day, seven days a week. The company made an early switch to a no clean manufacturing method in 1990 when the Liverpool facility was opened.

Andrew Young, manufacturing director for Alcatel, said the company chose to implement a no clean method into the new facility in view of the industry attitudes at the time. "The company made a decision to no longer use CFCs because it was inevitable they would be eventually phased out," he said. "It involved purchasing a lot of equipment and turned out to be a large investment, but the time was right to commit ourselves."

The company now uses a technique that involves the sealing of boards within a nitrogen environment during soldering. Because there is no oxygen in the atmosphere, no matters can oxidise on the board. "You get very controlled soldering, which means cleaning isn't required," Young said.

"We end up with a much higher quality product thanks to the new system," explained Young. "We also avoid damage to boards during cleaning, which can be quite a volatile process. Overall, there has been a definite process improvement."

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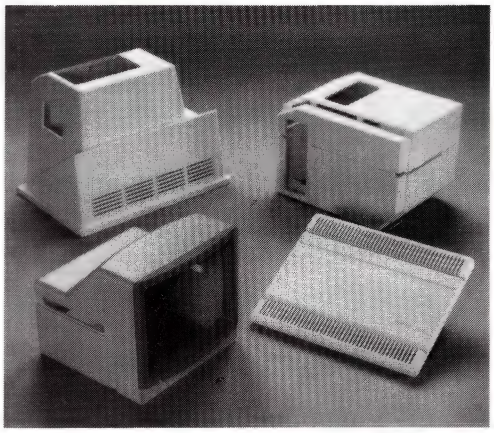

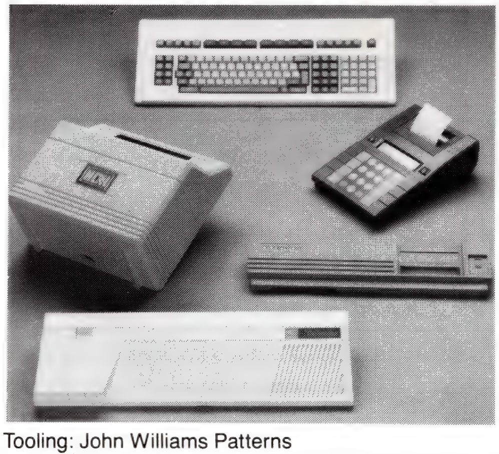

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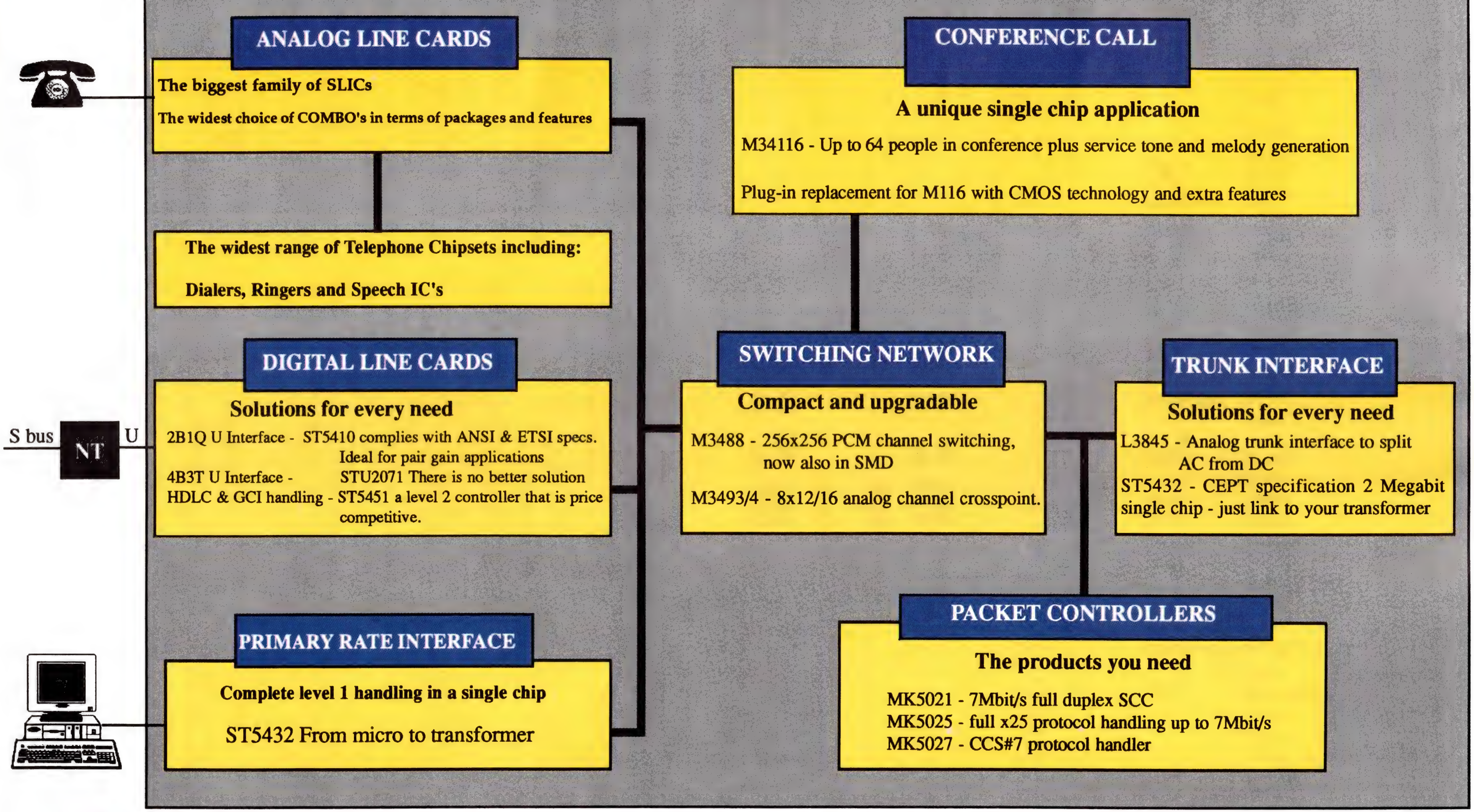

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Soldering on toward cleaner boards

Solder beading is a common problem in surface mount assembly, and it can be prevented. The authors show how.

By Wanda B Hance, Paul A Jaeger and Ning-Cheng Lee

Solder paste plays an important role in the formation of solder bonds between components and printed circuit boards. It allows the process to achieve high yield, high quality, high speed, and low cost solder joints.

However, if the material, the processing, or the components are not handled properly, defects can occur. The most common defect is solder balling.

Solder balling occurs when tiny solder balls form around solder joints and can result in starved joints and circuit shorts if they are not removed. The reasons for the formation of solder balls have been widely examined. Test methods for determining susceptibility to solder balling also have been well documented in specifications such as the IPC-SP-819.

Unfortunately, solder ball test results and manufacturing observations don't always correlate. One particularly difficult problem to predict by common solder ball testing is solder beading. Solder beads are large solder balls that form around components with very low standoff, such as chip capacitors or chip resistors, with or without the tiny solder balls.

Often, engineers may be confused by the clean solder ball test results but obvious solder beading phenomenon. The poor correlation between solder ball test results and solder beading observations suggests the two problems occur for different reasons.

With more attention being drawn to no-clean paste applications due to CFC concerns, a better understanding of the solder beading mechanism becomes essential.

Test board design

As shown in *Figure 1,* the test board pattern is a 1 in (2.54 cm) x 1 in (2.54 cm) Ag/Pd thick film hybrid board designed for mounting eight 1206 chip resistors. At the four corners are square pads to allow better observation of solder balling as well as wetting. Unless otherwise specified, all the pastes were printed 0.010 in (0.025 cm) thickness.

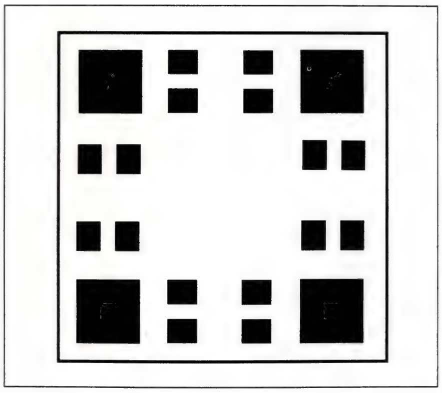

Figure 1. Test board layout.

Outgassing

At first a paste Y (90 per cent metal load, Sn63, -200/+325 mesh) which was known to have a solder beading problem was chosen for test. To simulate the low standoff of components and to allow observation, a 1 in (2.54 cm) x 1 in (2.54 cm) x 1 mm glass slide weighing 1.5 g was placed on top of the printed paste Y. (See *Figure 2*). This substrate was then processed through a two-zone in-line hot plate reflow system. The first zone was for preheat and the second zone was for reflow.

During the preheat stage the paste outgassed considerably and some of the paste was expelled and detached from the original print deposition.

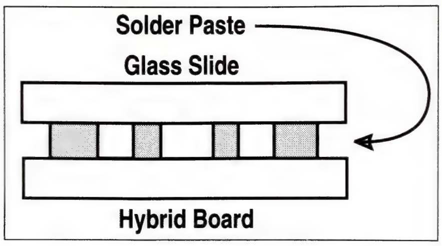

Figure 2. Glass slide setup.

At the reflow stage, the segregated paste melted and formed discrete solder discs underneath the glass slide. In certain cases, some of the molten solder discs drifted to the edge of the glass slide and emerged to form some large solder balls or solder beads.

But once the solder melted no further detachment of solder from the main deposit was observed, although outgassing still continued for quite a while. As expected, solder beading phenomenon showed up when the glass slide was replaced by actual 1206 chip resistors.

Apparently, outgassing during the preheat stage overrode the paste cohesive force and was directly responsible for the formation of solder beads.

Preheat effect

One way to control solder beading is to slow down the outgassing rate by regulating preheat conditions. Again, paste Y and chip resistors were used in this study. Several profiles were tried with preheat temperatures of 130, 150, and 170°C, respectively (See *Figure 3*).

For each profile, 40 chips were used and the solder beading rate was expressed as the average number of solder beads per chip. The results (see *Figure 4*) indicate the lower the preheat temperature, the lower the solder beading rate. The lower preheat temperature allowed the paste to outgas more slowly so it provided less impetus to expel the paste from the main deposit.

In this experiment the preheat time was kept constant. It is reasonable to expect that with each chosen preheat temperature, the preheat time could be adjusted to achieve the best result. But since preheat could also induce further oxidation of the solder powder which would aggravate solder beading, the optimum preheat condition should be a compromised result of both effects.

For the remaining solder beading tests profile (3) in *Figure 3* was used unless otherwise specified.

Beyond outgassing

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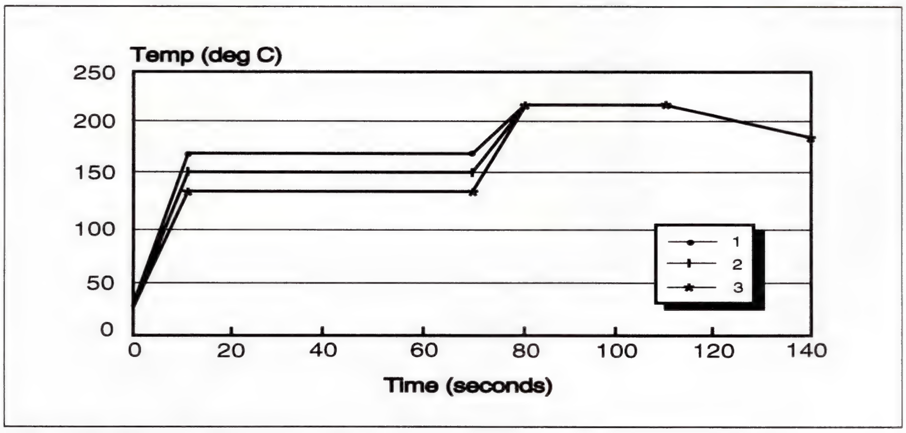

Figure 3. Scheme of reflow profiles.

measures a process engineer could use to control solder beading based on the understanding of outgassing.

But is outgassing the governing factor on solder beading? What other factors also could be important?

To answer these questions, the outgassing rate and solder beading two pastes, paste X (90 per cent Sn63, -200/+325) and paste Y (90 per cent Sn63, -200/+325), were compared. The outgassing rate was determined by processing 1 g of paste through a step heating treatment (see *Figure 5*) using a convection oven.

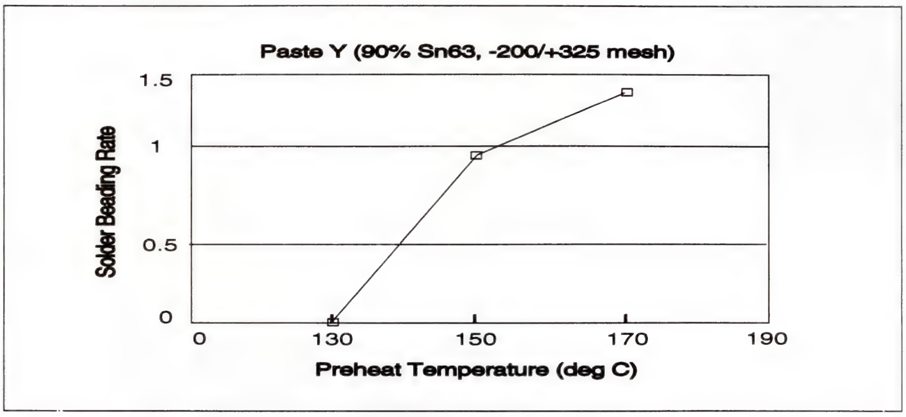

Figure 4. Relation between solder beading rate and preheat temperature.

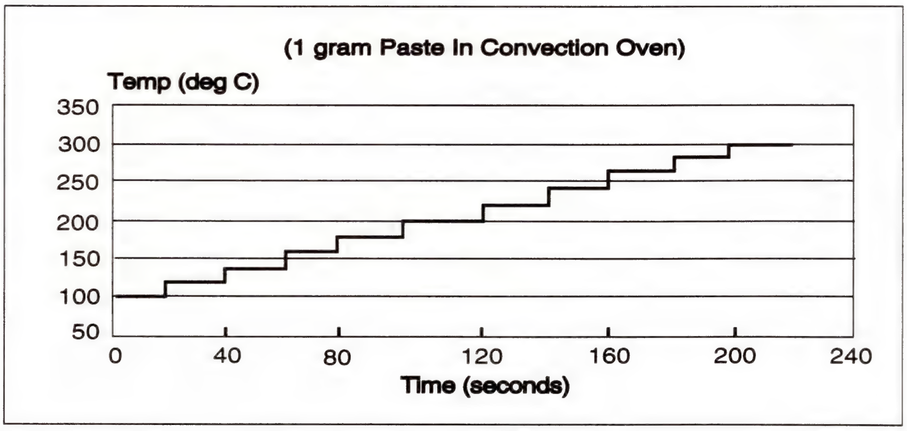

Figure 5. Step heating treatment for paste outgassing study.

After each heating step, the paste was weighed and subjected to the next heating step. The outgassing rate was illustrated by plotting the accumulated percentage weight loss of paste against temperature. From *Figures* 7 and *8* it can be seen that although paste Y showed a much lower outgassing rate, it exhibited a considerably higher solder beading rate than paste X.

A glass slide test was then conducted on both pastes X and Y. As paste Y heated up, solder beading developed. No paste slump or paste detachment was observed in paste X, although more rigorous outgassing was observed. This means the cohesive force of paste X overrode the outgassing force and became the governing factor in solder beading.

Cold welding

A soaking test was conducted on pastes X and Y to determine the nature of the strong cohesive force of paste X.

The paste was first printed onto the hybrid board, sent through a preheat profile (130°C for 70 s), and soaked in boiling isopropanol for 30 s with mild agitation. The sample was then examined for paste integrity.

After preheat, both pastes seemed to be comparable. After soaking, paste Y was washed away while paste X still retained its major integrity. Since the soaking treatment was considered to be an effective way of removing organic flux chemicals, the strong cohesive force of paste X was then believed to be metallic and was attributed to cold welding phenomenon.

Another possibility is the cohesive force might come from the metal salt formation which could serve as a coupling agent between solder powders. However, this possibility was ruled out.

Activation temperature effect

As cold welding occurs between metals with very clean surfaces, this suggests the solder powder surface oxide in paste X was already removed by flux at the preheat stage. The flux of paste X should be active at preheat temperature. If this were true, it would mean solder beading could be controlled through regulating (supposedly lowering) the activation temperature of flux.

An experiment was accordingly designed to clarify the relation between solder beading and activation temperature of flux. A new series of fluxes A, B, C, and D were formulated so that all remaining variables were kept constant except possibly the activation temperature. A paste (90 per cent Sn63, -200/+325) was made with each flux and was checked for outgassing and viscosity. The results indicate that all pastes A, B, C, and D exhibited comparable viscosity (approximately 550,000 cps) and comparable outgassing rate (see *Figure 8*).

The activation temperature of the four fluxes was determined with a wetting balance. The substrate material was copper coupon which was precleaned and then baked at 100°C for three hours beforehand. Since the wetting behaviour of fluxes at a temperature near preheat condition was considered essential for understanding cold welding, a solder alloy 43Bi/34Sn/20Pb with a melting point 100°C was chosen and the wetting test was conducted at 150, 180, 210, and

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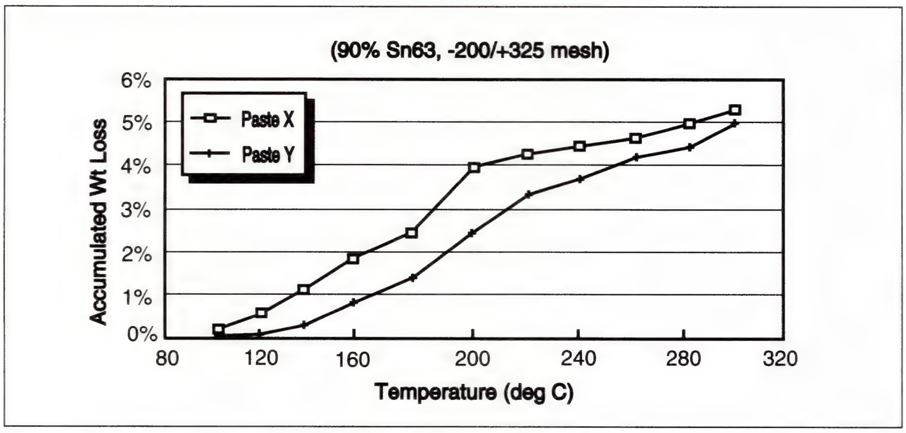

Figure 6. Outgassing rate of pastes X and Y.

240°C. For each flux the wetting time at each temperature was determined and plotted against temperature.

Data indicate that wetting time S can be expressed as an exponential function of temperature with S increasing with decreasing temperature:

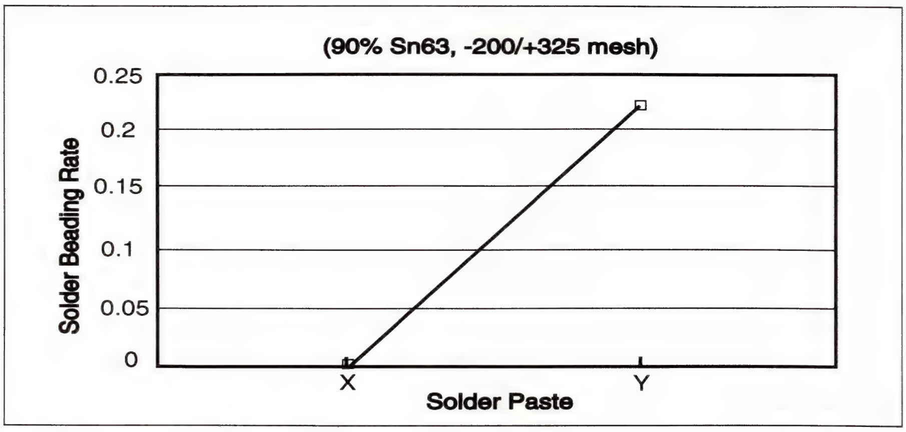

Figure 7. Solder beading rate of X and Y.

$$S = K e^{A/T}$$

where K and A are constants and T is the temperature in degrees Kelvin.

Practically, the activation temperature can be defined as the minimum temperature needed for a flux to function with a wetting time no more than a certain value. Since soldering applications can vary considerably the choice of criteria becomes a relatively subjective decision.

In this study, 20 seconds wetting time was chosen considering that a solder paste reflow process normally would take several minutes. The activation temperature for fluxes A, B, C, and D was then calculated using equation (1).

Using the 130°C preheat profile as shown in *Figure 3,* the solder beading rate of pastes A, B, C, and D was determined and plotted against the activation temperature of fluxes A, B, C, and D, respectively. Results showed the solder beading rate decreases rapidly at first, then gradually approaches zero when the activation temperature decreases.

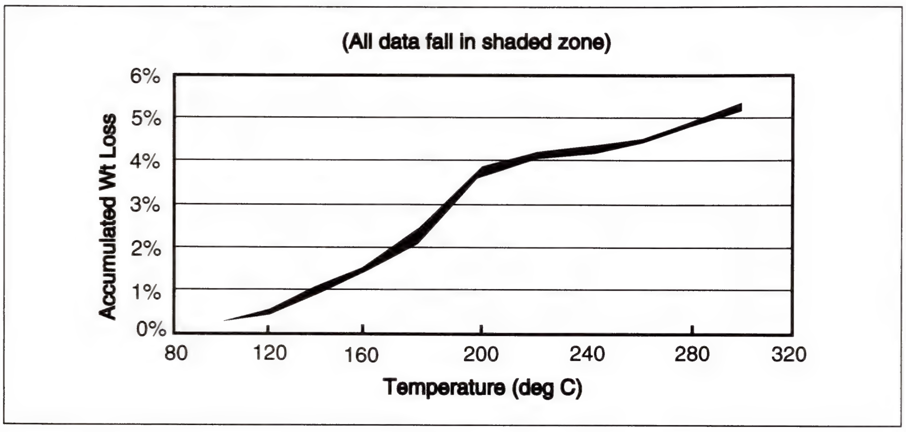

Figure 8. Outgassing rate of pastes A, B, C and D.

The definite positive effect of low activation temperature on reducing solder beading strongly supports the cold welding hypothesis. As a double check, the preheat/soaking test was conducted on the four pastes. It was found the resistance of preheated paste against washing increased from A to D — the lower the activation temperature, the higher the resistance against washing.

Metal load effect

One of the major parameters of solder paste composition is metal load. To understand its impact on solder beading, four pastes were made out of flux C, with metal loads 88, 89, 90, and 91 per cent respectively.

Again profile (3) was used and the solder beading rate result was plotted against metal content. The solder beading rate decreases with increasing metal load. This could at least partially be because of the cold welding mechanism.

When the metal load increases, the powders are packed more densely and therefore have more chance to contact each other. This in turn would promote the probability of cold welding. But the metal load effect also could be explained by the viscosity factor. Generally paste viscosity increases with increasing metal load. It is reasonable to expect a paste with higher viscosity to hold its integrity better against outgassing. Also, at higher metal load, the source of outgassing is reduced. This could also contribute to the lower beading rate.

Oxide content effect

For solder paste, the oxide content of solder powders often can be directly associated with paste performance. In this experiment the metal oxide content was determined by measuring the weight difference of solder powders before and after fluxing/coalescing treatment, and was expressed as weight percentage of powders.

Two batches of Sn63 powder (-200/+325) were prepared, with oxide levels of 0.066 per cent and 0.198 per cent respectively. A paste with 90 per cent metal load was then made for each powder batch and was evaluated for solder beading rate.

The result indicates that paste with higher oxide content exhibited a higher solder beading rate. This is consistent with the cold welding hypothesis. With higher oxide content, the powders would have more barriers to overcome before they could cold weld to each other.

Regarding activation temperature,

the flux would require higher temperature to clean up higher amounts of oxide if the time allowed for fluxing is fixed. This means the flux would display a higher apparent activation temperature. Accordingly, a higher solder beading rate would be expected, as verified by the data.

Besides the cold welding model, the possibility of metal salt forming between powders was also suggested to explain the strong cohesive force against soaking treatment. If this is true, the presence of higher oxide content should not affect the solder beading rate as oxide would contribute to the metal salt formation, so the metal salt formation mechanism is not correct.

Powder size effect

Depending on the application, paste can be made out of powders of various size ranges. The most popular sizes used by the SMT industry are -200/+325 mesh (44-74 µm) and -325/+500 mesh (25-44 µm).

To understand the powder size effect, a total of eight pastes (90 per cent Sn63) were made out of the four fluxes A, B, C, D and powders of those two size ranges. Solder beading rate was then determined on those pastes.

In general, the pastes using coarser powders (-200/+325) showed lower solder beading rates than those using finer powders (-325/+500). This is probably because of the oxide content difference. With the same metal load (90 per cent) coarser powders usually exhibit less oxide content than finer powders because of their smaller overall powder surface area. A lower solder beading rate would then be expected for the coarser powders.

Print thickness effect

Print thickness is another parameter the process engineer needs to consider to optimise the soldering process. To magnify the possible effect of this parameter, two different print thicknesses, 10 mils (250 µm) and 20 mils (500 µm) were chosen for testing. The result indicates solder beading rate increases with increasing print thickness. This is possibly because of the higher slump potential and more flux available for outgassing.

Besides the parameters discussed above, some other factors might also affect solder beading. For example, land pattern design for low stand-off components determine how much paste is compressed by the chips. Flux chemistry can also play an important role. A paste can exhibit high cohesive force because of the high surface tension of flux system and so could display a relatively low solder beading rate. Moisture trapped in the chips could also contribute to solder beading.

Overall, solder beading is a fairly complicated phenomenon. It could be regarded as a special case of solder balling. What differentiates it from normal solder balling is the need for low stand-off components. Common solder ball tests are not usually conducted with the use of a low stand-off component or a cover substrate and so those tests fail to foresee the solder beading problem.

Conclusion

Solder beading was directly caused by flux outgassing during the preheat stage. This problem can be remedied by slowing down outgassing through a milder preheat profile or by reducing print thickness.

It also can be corrected by enhancing the paste cohesive force by cold welding of solder powders during the preheat stage. This can be done by using a lower activation temperature flux, coarser solder powder, higher metal load, and solder powders with lower oxide content. ☐

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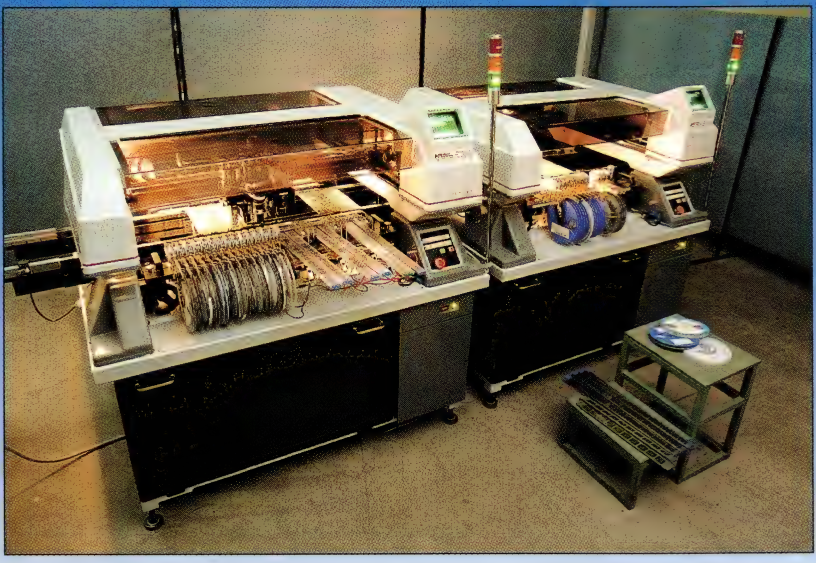

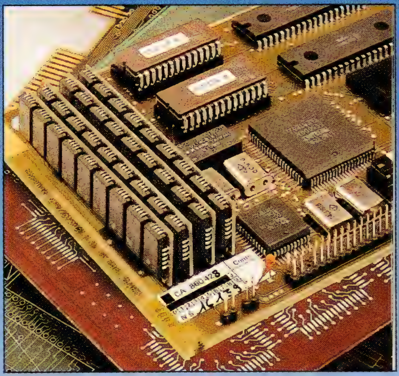

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In this, the second of a two part series on Taiwan, *AEE* editor *Jennifer Liston* visits two companies which make test and measurement (T&M) instruments.

Escort Instruments Corp and Good Will (GW) Instruments may be rivals but they have much in common, which is why both are strong players in a fiercely competitive market.

Both companies regard new product development as essential to their survival. Both have a "world market" attitude, realising they have to look beyond Taiwan's boundaries to find global markets for their products. And both were certified to the ISO 9002 manufacturing standard last year — the first T&M manufacturing companies in Taiwan to achieve this.

Escort's Dave H I Yang belies the fact he is chairman of a US$300 m (A$216 m) a year company. Quietly spoken and unassuming, Yang talks frankly and openly about his company, his vision and the new products planned for the future.

Quality awards from Tektronix, Beckman, B&K, Ballantine, and MCM adorn the office wall. Escort has manufactured for US T&M giant Tektronix and European T&M company Philips for the past 10 years. It supplies to Ballantine Labs in the US products manufactured to MIL-T-28800 Class 5 shock and vibration specifications. It also manufactures and rebadges products for B&K Precision, Beckman, Leader, Iwatsu, Heme and Kenwood.

The company began manufacturing digital tachometers for motor bikes 20 years ago. Now its main product lines are analogue oscilloscopes — it started manufacturing digital oscilloscopes this year — digital multimeters (DMMs), function generators, counters, and other low end test instruments.

GW has been manufacturing test and measurement instruments since 1975. It also manufactures for Tektronix, as well as Hitachi. Its product range includes oscilloscopes (analogue and digital); spectrum analysers; FM/AM signal and function generators; DMMs; regulated dc power supplies; as well as a range of automatic test equipment and environmental test equipment. The company also supplies a range of public address, closed circuit television and intercom equipment.

Both companies also manufacture and sell products under their own brand names. Original equipment manufacturer (OEM) business comprises about 30 per cent of GW's overall business.

Escort's Yang believes ISO 9000 is "very important for companies if they want to export to Europe — they have no choice — and they must have UL approval for the US".

Stanley Hwang, export sales manager with GW agrees it is vital for a company to be aware of quality. "We think it is necessary because it can improve your company's health," he says. "You can get rid of unnecessary procedures or waste of time, and you can have smoother systems and avoid arguments."

Both companies believe R&D is important. Escort employs 30 people in R&D out of a total of 200, spending on it a whopping US$100 m–US$150 m a year, and, says Yang, "it is very important to do so". The company's design subsidiaries in Japan and the US employ 10 people and eight people respectively. GW employs 42 people in R&D out of a total of 250, spending on it annually about US$2.5 m.

Escort designs to the specifications supplied by the OEM. But OEMs are usually open to any engineering changes the company suggests, says Yang. "We don't keep our doors closed when we plan new products. Our people go to the OEMs and talk with them. There aren't many manufacturers in Taiwan like that! A good friend is better than good business."

Escort is presently developing a function generator for Tektronix; a universal LCR meter with dual display for B&K Precision; a 1000 A ac/dc clamp meter; and two versions (Escort and OEM) of a 320 20 MHz Palmscope combining a digital scope, logic analyser, frequency counter and DMM.

Another product in the pipeline is an automobile engine analyser 5000 counter which already has two interested customers in the US. Patents are pending for the product's pulse width and duty cycle for electronic fuel injection feature. Escort is also developing a dual display five and a half digit benchtop DMM which will be ready for production next month.

Like Escort, GW's R&D group has many designs on the drawing board. It is presently developing storage scopes, electronic loads, HF high bandwidth counters, and synthesisers, all under the GW badge. "It's a policy of ours to have our own designs," says Hwang.

Out of 200 entries, the company won the 1993 Outstanding Product Design Award in Taiwan's National Excellence Competition for its GOS 6101 100 MHz scope, the GCT 630 ground continuity tester, and the GDM 8055 five and a half digit DMM.

Many Taiwanese companies are moving to mainland China where labour costs are a fraction of most other Asian countries (see *Asia's kitten becomes a tiger,* AEE June 1994). Labour costs are as low as US$150 a month in the North.

GW has opened an office there; Hwang says the company's relationship with China "is still very risky but it is a fruitful and important market for us". He says GW may "start manufacturing there in one or two years because of the market".

But Escort's Yang has no plans to establish a facility outside Taiwan. "Even though labour costs are low, efficiency is not good," he remarks. "The Republic Of China is about 15 years behind Taiwan in terms of manufacturing production technology. It doesn't know how to control quality or how to design to requirements."

About half of GW's product range is manufactured in its facility in Malaysia, where labour costs are one third of Taiwan's. Management and quality assurance personnel from the Taiwan factory trained the local people. "It's a very successful factory and quality is no problem," says Hwang.

Escort has 138 distributors around the world and is not represented in the US or Japan. But GW's products are resold by Hitachi in Japan. Hwang says the US market "wasn't as good as we expected last year ... it's very competitive. Many T&M manufacturers opened offices or sales channels there." Five years ago there were only seven T&M companies represented in the US, now there are 17, he says.

Hwang says many Korean T&M companies are investing a lot of money in promoting themselves in the US. "Their advantage is price because the labour cost in Korea is about half of Taiwan's," he explains. "Costs have increased [here in Taiwan] so manufacturing is now a headache."

Escort can manufacture up to 1000 hand-held DMMs each day or 200-500 more complicated benchtop instruments. Eighty people work in production. T&M instruments account for 60 per cent of GW's total business. The company's Taiwan facility manufactured 10,000 scopes last year and 30,000 low end units such as multimeters. Its Malaysian facility manufactured 8000 scopes last year. [1270] (2) ☐

Escort and GW are represented in Australia by Emona Instruments, NSW.

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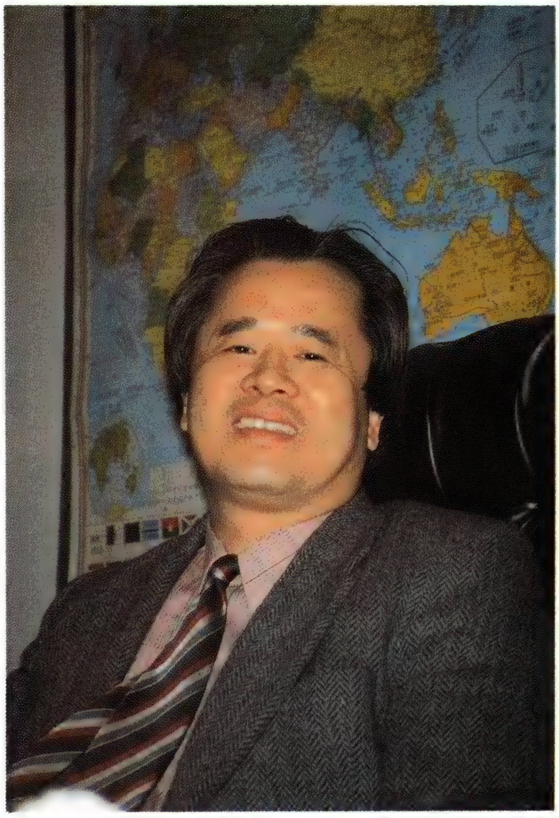

Dave H I Yang, chairman of Escort Instruments Corp: "We don't keep our doors closed when we plan new products."

Stanley Hwang, export sales manager with Good Will (GW) Instrument: "Quality is necessary because it can improve your company's health."

DESIGN TIPS #5

Improving performance of single supply analogue circuits

The choice of amplifier (or other analogue chip) is a critical step toward a successful single supply design. *Walt Jung* and *James Wong* examine some typical precision analogue functions with op amps and other devices.

More frequent use of single supply power in analogue and digital circuits means designers now face challenges if they are to obtain the type of performance they are used to at higher voltages.

Most op amps today are designed for traditional ±15 V supplies, which allows ample input common-mode (CM) voltage range, as well as a wide output range, typically ±10 V for both.

Because power conservation is a major reason for using them, single supply systems often have closely restricted supply voltage, for example, +12 V down to +5 V, as low as +3 V, and even in some cases +1.5 V. At these low voltages most standard dual supply op amps cease to function at all, while some may still operate with degraded specifications. Until recently, low-voltage amplifier choices have been limited.

General purpose 741s and 1558s and most FET-input amplifiers operate on supplies as low as ±5 V (10 V total). Precision amplifier families such as OP-07 or OP-27 types don't work below ±5 V. Types from selected families may be used over regions of this voltage spectrum; for example the AD705 and OP-97 families are useful down to ±2.25 V (4.5 V), and the AD817 wideband op amp is specified for +5 V use.

But in general, only amplifiers that are specifically for single supply use will function without major limits in CM range and output swing below +10 V. Examples are the LM324/LM358 families as general-purpose modest performance single supply types.

Amplifiers designed for ±15 V operation typically need 2 to 5 V of headroom at input and output, with respect to both supply rails. Even more-flexible dual-supply designs, such as the AD705 and OP-97 families, approach only to within 1 V.

In low-voltage (3 to 5 V) single supply applications, such headroom requirements become critical limitations to linear operation over even modest signal swings. For this reason, single supply amplifier input stages are designed to remain fully linear, even when the input CM voltage is at the negative rail, or 0 V.

Differential input-stage architectures allowing this involve PNP bipolars, CMOS (or PMOS) inputs, and N-channel JFET inputs. The various devices result in differing input bias currents, noise voltages/currents, and offset voltages/drifts.

With the exception of parts specified with output swing of 0 to $+V_s$ (or "rail-to-rail"), most op amps swing to within only 1 to 2 V of the positive rail. So, on supplies of 5 V or less, output swing is greatly reduced in relation to the supply. Even if the input noise floor were to remain constant (which it seldom does) signal to noise (SNR) and dynamic range suffer.

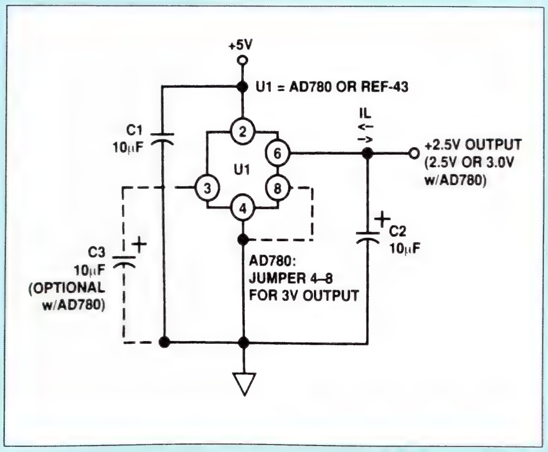

Figure 1. Pseudo-ground at 2.5 or 3.0 V using a reference capable of sourcing and sinking current.

Aside from basic cost factors, another reason ~for single supply designs is to conserve power since they are quite often used in battery-operated equipment. Not only are they designed to perform at very low voltage, but they must also have low quiescent current per channel (I_Q).

Unfortunately, low current designs need basic tradeoffs: in general, sacrifices involve bandwidth, slew rate, and input noise voltage.

Stand-by current drain (no signal) per ampli~fier can often be used to qualify a device for critical system power conditions. In the absence of a standard industry definition we call devices with I_Q of ≤1 mA/channel low power, and those with I_Q of ≤100 μA/channel micro power.

Bandwidth versus noise is a highly likely tradeoff. Lower noise can be attained at the price of increased current.

In a low power design environment, engineers must face not just generally slower speed in the op amps, but also higher circuit impedances, which themselves can set bandwidth restrictions. Again, tradeoffs exist.

Where is ground? This issue can become quite important in single supply op amp ac-coupled circuits, since a circuit designer can arbitrarily choose any value for this "false" or pseudo-ground return level. The best choice depends on the application, but a flexible choice of amplifier circuits and devices that can be used in them helps make signal referencing easier, particularly in cases where substantial dynamic (ie, ac) current is present.

Possible choices range from a simple ac-bypassed resistive divider to fully buffered op amp follower stages that provide the lowest wide band dynamic impedance. A well bypassed noise-free divider is suitable for high-impedance loads, where the dynamic current is low. When dynamic currents are higher the divider can be buffered with a follower-connected op amp.

If a reasonably accurate "pseudo-ground" voltage is required, a voltage-reference IC that can source or sink current is desirable. (See *Figure 1*). Operating from a 5 V supply, this circuit handles load currents into/from the 2.5 V source with a low ac impedance, aided

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by the low ESR bypass caps (either tantalum or aluminum electrolytics). The REF-43 provides a 2.5 V output, as does the AD780, with the same pin out. With pin 8 grounded, the lower-noise AD780 can also be used for a 3 V output; and output transient response can be optimised with optional bypass capacitor, C_3.

Power-supply noise can defeat even the best paper designs if not properly planned for and dealt with. Low power analogue ICs which tend to have poor supply rejection are susceptible to the problem. Commonly used 5 V supplies for computer and digital logic circuitry are especially bad for noise in analogue circuitry.

Because of the fast edges inherent in digital circuitry and the prevalent use of switching-type supplies, simple filtering may not be adequate enough to use them with precision analogue stages. While use of a supply common to digital circuits may save space and money, its disadvantages should be taken into account where noise is critical.

Digital supply feeds taken from the middle of a logic layout contain huge amounts of high frequency noise, 100 mV and more. Switching-type logic supplies also have large output spikes. It is better to use a separate, low noise linear-mode supply for sensitive analogue circuits where possible.

If a 5 V logic supply must be used, isolation and circuit partitioning can help greatly, as can optimised decoupling and filtering. Make sure that power for analogue circuitry is wired directly to the supply terminals, not from downstream logic stages. This avoids both static and dynamic voltage drops due to logic currents and their rapid fluctuations.

Bypass capacitors alone are usually not adequate for filtering switch-mode glitches, so additional steps should be taken. For example, one can isolate logic noise with a balanced in-line LC filter.

This filter uses a high-capacitance composite output capacitor and two high-frequency inductors — one in each line — made from a "three-turn" [actually two complete turns] wrapped toroidal ferrite bead. The capacitors, a parallel 100 µF electrolytic, 10 to 22 µF tantalum, and 0.1 µF ceramic, can be low-ESR switching types for best performance, but this is not absolutely essential. Such filters can suppress logic glitch noise by 40 dB and more.

Limits of swing

Even if a device has wide output-swing capability, the application configuration can have swing limitations. For example, consider the popular two-op-amp instrumentation amplifier shown in *Figure 2*. Normally a dual-supply design, it is adapted here for single supply use with selectable gains of 10x or 100x.

At first glance, one might expect that this 100x instrumentation amp should easily amplify small positive voltages, for example a +10 mV differential input [$V_{IN}(-) = 0$, $V_{IN}(+) = 10$ mV] to produce +1 V at V_{OUT}. However, even with near-perfect characteristics for amplifiers A and B, closer examination shows a potential difficulty.

Note that to satisfy loop requirements and produce 1 V at V_{OUT}, V_{OA} must be 0 V while sinking current, a factor which demands ideal saturation characteristics of U1A. Practically speaking, this instrumentation amp configuration needs excellent output characteristics in both amplifiers for best linearity.

So, even though an op amp may be well designed for single supply operation, its performance can still be constrained by the chosen configuration. It's also worth noting that if a five-resistance instrumentation amp topology is used to obtain single resistor gain-setting (four fixed resistances plus a variable gain-setting resistor connected between the summing points), the ideal voltage output demanded of amplifier A can be negative! Although rail-to-rail output-stage op amps help improve CM handling, topology is also important to performance.

In spite of these inherent limitations, the topology of *Figure 2* is still useful when carefully applied. For gain of 100, the circuit provides subtraction with gain (and common-mode rejection) when the two ratios, $(R_1 + R_2)/R_3$ and $(R_5 + R_6)/R_4$, are equal. The 100x gain (G = 100) is equal to $1 + (R_5 + R_6)/R_4$. In the switch's gain of-10-position, the gain is $1 + R_6/(R_5 + R_4)$. For either gain, the resistor ratios on both sides must be equal for good CMR.

This approach has advantages and disadvantages in practical implementation. It is not as simple in concept to gain-program as the five-resistor topology (which simply adds an R_G resistor between the summing points of a four-resistor ratio-matched network).

However, it's worth noting that, in the topology of *Figure 2*, 10-to-100 Ω of series switch resistance has negligible effect on gain accuracy, while it would have significant impact when switching R_G in the five-resistance topology.

Keys to performance of this circuit are the resistor network and the amplifier. For best performance with premium amplifiers, the network should have a ratio-match specification of 0.1 per cent minimum, and 0.01 per cent as a goal. For ideal amplifiers, the output CM error due to 0.01 per cent match resistors will be of the order of -100 dB for a gain of 10, or -120 dB for a gain of 100. The suggested network is available with ratio-matching to 0.01 per cent.

The circuit easily can be gain-switched with jumpers, or CMOS switches. Operating on single supplies, the CM limitations of the configuration must be observed, as noted. V_{OUT} will be referred to the potential applied to the network's V_R pin, but watch out for potential difficulties due to inverted V_R on the intermediate output V_{OA} — $V_{IN}(-)$ must be more positive than V_R. With dual supplies, the requirements are not as stringent.

For designs needing single supplies, it is usually best to use amplifiers expressly designed for the job. Among the performance specifications that will be enhanced are supply power and operating ranges, dynamic range, input/output ranges, and increased overall linearity. ☐

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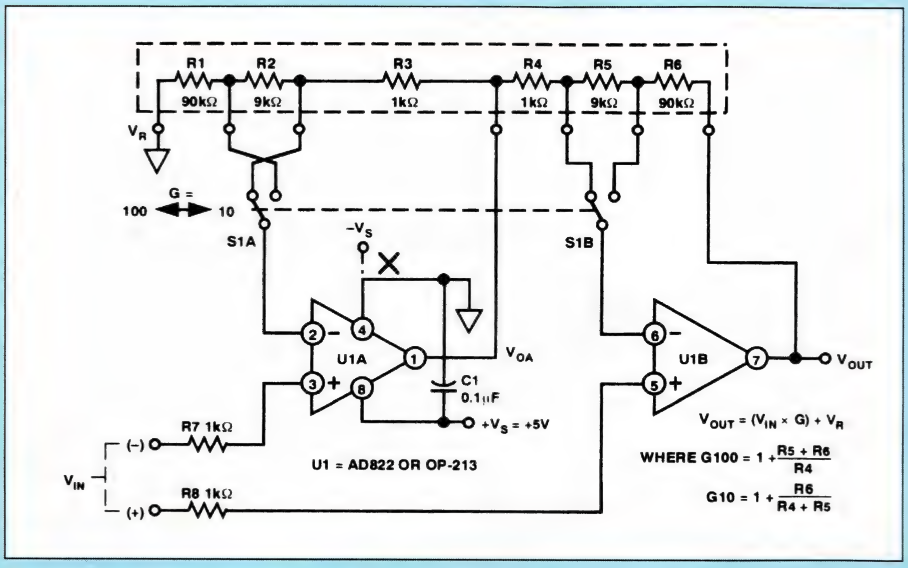

Figure 2. Two-op-amp programmable gain instrumentation amplifier for single supply applications.

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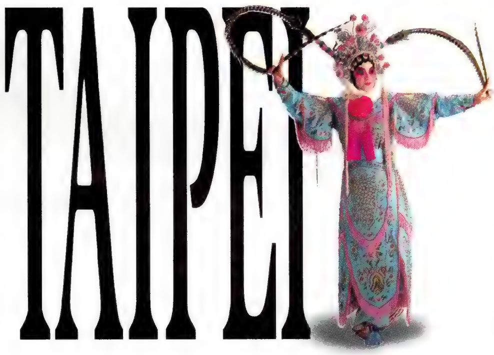

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SINGLE SUPPLY CIRCUIT APPLICATIONS

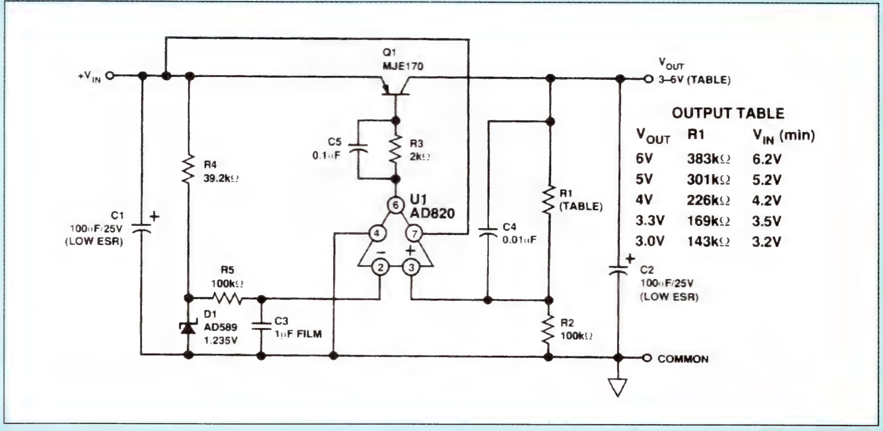
There are a variety of considerations when stable, accurate dc voltage references are made to work from 5 V (and lower) supplies. These include quiescent power consumption and overall power efficiency, the ability to operate down to 3 V, low input/output (dropout) capability, and minimising noise output. Because supplies less than 5 V can't support devices such as buried Zener diodes, low voltage references must be band gap types.

With a boost transistor added within a low-dropout reference circuit, output currents greater than 100 mA are possible, still retaining low stand-by current and low dropout voltage.

Figure 3 shows a low-dropout regulator with 800 µA of stand-by current, suitable for a variety of voltages and output currents up to 100 mA. It achieves a 100 mA current using a controlled-gain pass transistor Q1, type MJE170. Output current control is provided by limiting base drive to Q1 by a series resistance, R_3. This limits the base current to about 2 mA, so that with maximum HFE of Q1, no more than 500 mA is allowed to flow, limiting short-circuit dissipation to safe levels (if a heat-sink and fuse are employed).

Output voltage level is chosen simply by programming R_1 according to the table. Dropout with a 100 mA load is about 200 mV, thus a 5 V output is maintained for inputs above 5.2 V. Output voltages down to 3 V or less are possible.

The circuit responds well to stepped loads. Transient error is only a few mV p-p, for a 30-100 mA load change. This is achieved partially through low ESR switching type capacitors (C_1-C_2); the circuit also works with smaller value conventional electrolytics (but with greater errors). Low output noise is attained in this circuit with the reference filter, R_5-C_3. ☐



OUTPUT TABLE

V_{OUT}	R1	V_{IN} (min)
6V	383kΩ	6.2V
5V	301kΩ	5.2V
4V	226kΩ	4.2V
3.3V	169kΩ	3.5V
3.0V	143kΩ	3.2V

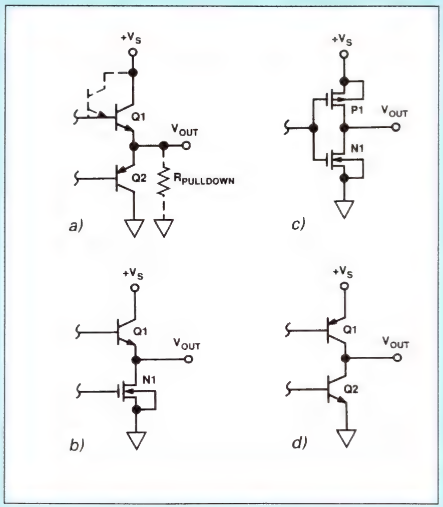
Figure 3. Low-dropout, low-noise, low-voltage regulator capable of 100 mA output.

AMPLIFIER OUTPUT STAGES

While output swing can be very important in single supply applications, not all single supply amplifier outputs are designed to swing all the way to the negative rail (ground). Some may swing to within a diode drop (≈ 0.6 V), others to within a few tens of mV. Only a few swing to within 1 mV of the negative rail, and very few swing nearly to both supply rails.

To understand which devices work best in applications where output swing is critical, a designer needs to know about the design of the output stage. These vary widely in detail, so knowledge of their architecture can be critical to an informed selection. The figure illustrates a sampling of some output-stage topologies used in Analog Devices' single supply amplifiers.

The complementary emitter-follower stage of *Figure A*, employing bipolar transistors (an NPN transistor for Q1 and a PNP for Q2), can swing to within a diode drop of each rail, at best. It can not pull right to ground without outside help, such as by adding $R_{PULLDOWN}$. This optional external resistor (which can also include the op-amp's gain-set resistors) bypasses the lower PNP, with its saturation limitation. This technique allows output linearity to ground only when sourcing current and it can also raise overall dissipation, which may be excessive for sustained high-level outputs.



Figures A,B,C,D.

Amplifiers with this type of output have their uses, but should be carefully applied to minimise tradeoffs in single supply applications.

The output stage of *Figure B* uses a bipolar emitter follower and NMOS common-source. Though inherently asymmetric in terms of voltage swing it uses the NMOS pull down to achieve very low saturation voltage to ground. However, saturation voltage to the positive rail is ≥.

The CMOS stage of *Figure C* is fully complementary and offers a resistive connection to the supply rails for both high and low output, a swing of 0 to $+V_S$ or "rail to rail". With appropriate low R_{ON} devices for P1/N1, the saturation drop to either rail can be ≤1 mV at low currents.

Because this stage is inherently Class AB, the amplifier design must carefully control the static currents in P1-N1 to maintain low quiescent current. For output currents of a few milliamperes, this type of output stage is effective and quite versatile due to its wide swing.

The complementary-bipolar common-emitter stage of *Figure D* is another rail-rail output stage. Saturation drops range from a few millivolts to a couple of hundred mV, over current ranges of up to about 20 mA.

As with the CMOS rail-to-rail output stage, this bipolar counterpart is effective and versatile, but the design of the amplifier is more critical to avoid tradeoffs in power. ☐

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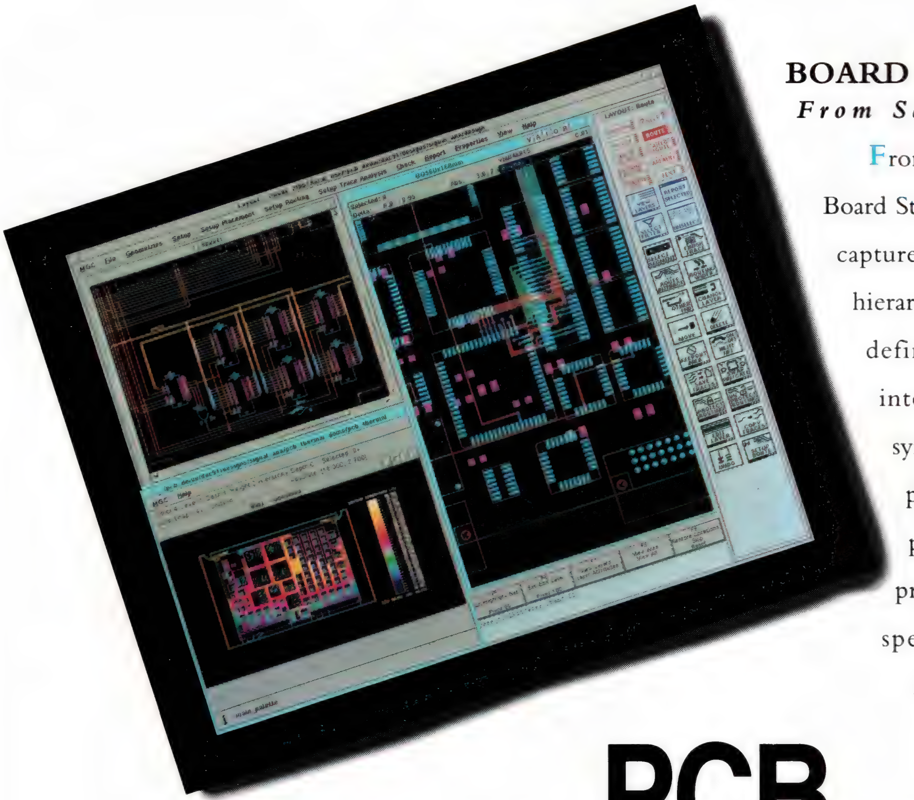

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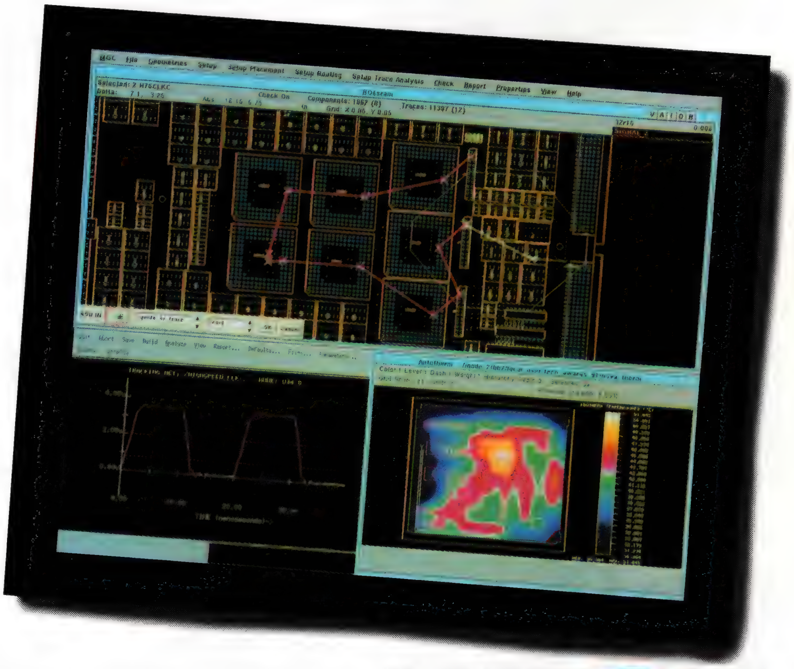

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Geoff O'Reilly

Capturing creativity

By Jennifer Liston

In harnessing the creative talents of three electronics engineers in 1984, Hypertec's managing director now heads a technology-driven organisation.

Geoff O'Reilly, the managing director of Sydney-based Hypertec, may not have an engineering background but it hasn't stopped him from recognising opportunities in the IT industry.

After completing a commerce degree at the University of NSW in 1969, he spent 15 years with CSR in a variety of commercial, marketing and management jobs. He then decided he "wanted to do his own thing". In 1971 he completed an MBA at London Business School in the UK.

He established O'Reilly Computer in 1978, importing PCs from Japan, reselling them directly with accounting software. "In those days — pre IBM PC — I typically had to explain to people what personal computers were," he says.

While developing the business, O'Reilly says he had to do "some quite interesting technical work".

After selling his company for "an offer he couldn't refuse" in 1984 he engaged the services of three young engineers who had formed a hardware and system software consulting group called Hypertec.

The same year, he invested a "substantial amount of money" in the company and advised the engineers to concentrate on developing new products. O'Reilly wanted them to apply their energies to something that was practical and commercial — not always easy with highly creative people, he says.

He acknowledges he was lucky to come across them. "This was the classic seed venture," he says. "I perceived there was substantial creative technical skill and that almost anything they could do would be of substantial benefit."

O'Reilly says they debated for "quite some time" over the types of product they would develop, and many interesting ideas emerged. "Eventually I started running out of patience and money. We had to develop something to generate a cash flow," says O'Reilly.

In 1986 Hypertec released its first add-on products for PCs. "Memory add-ons are still our major product line," he says.

Hypertec's turnover this financial year is close to $50 m and the company boasts a 50 per cent per annum compound growth. O'Reilly owns 60 per cent of the company, the other 40 per cent shared equally between employees and portfolio investors Australian Mezzanine Investments. Half the company's revenue is generated from export and O'Reilly expects most of the company's future growth to be in exports.

Although it has an office in New Zealand, Hypertec's biggest overseas market is the UK, a result of O'Reilly's decision in 1989 to test the waters in a market "big enough to have a go and competitive enough to test us.

"I decided we'd either broaden our product base or stick with niche products and go overseas," he explains. "If we could be successful [in the UK] then there was a chance we'd succeed in other markets." Now Hypertec has opened an office in Boston in the US to carry out "market exploration" there. O'Reilly emphasises he doesn't want to compete with the "extraordinarily competitive distribution market in the US", but believes he can be competitive in the sale of technology.

Hypertec lists notables such as IBM, Memorex Telex, Compaq, Olivetti, Apricot as well as Osborne and Bull among its customers. O'Reilly expects IBM to be Hypertec's biggest single customer this year and next year.

Selling to IBM was "one of those happy coincidences. We were in the right place at the right time," says O'Reilly. Since then the company has used the IBM channel quite extensively to access other customers.

About nine months ago Hypertec began to manufacture memory modules and this has nearly doubled the company's total memory business, O'Reilly says, adding "It makes us that much

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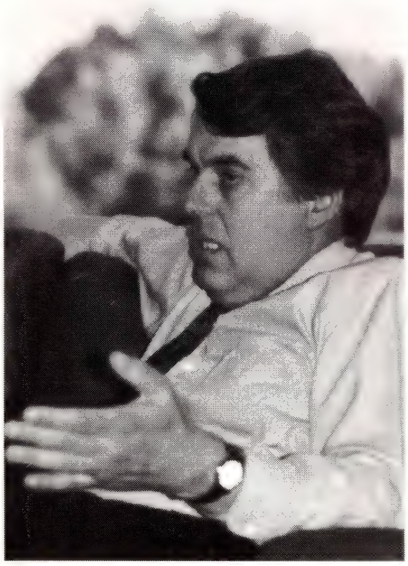

more competitive and brings us into markets we hadn't been in. It has stimulated the export business considerably and has generally enhanced our positioning."

The company employs eight people in R&D and about five per cent of its turnover is invested in R&D. "In the first few years the R&D expenditure was as high as 30 to 40 per cent," says O'Reilly, who believes it's still probably too high, "given the margins in the business".

He explains that he couldn't possibly afford to spend 10 to 15 per cent on R&D: "It's a brutally competitive industry, and that's a sign of maturing of the industry. The key element with R&D is quality, not quantity."

Technology developed by Hypertec is now applied in products bought by IBM. "Obviously we had to be competitive in price, delivery and all the usual things but the springboard of the product was clearly the technology," says O'Reilly.

He continues: "Hypertec is a good example where pure persistence and concentration on quality in particular sets of technical issues means we've been able to sell classic coals to Newcastle. It [IBM] spends millions on research but that doesn't mean a little company like Hypertec can't find a niche where it creates a technology that has the aha! effect on a corporation like IBM."

O'Reilly is adamant that while Australia lacks nothing when it comes to intellectual technological brilliance, an Australian company must recognise what it can and can not do. "We work hard on that as a strength and don't play games we are not equipped to play," he says. "For example, there's no point in taking on the Taiwanese in mass production."

Until now, O'Reilly has not considered patenting any products developed by the company because "industry technology moves so quickly". But technology developed by Hypertec last year has "sufficient uniqueness" to merit a visit to the US by the company's key design engineer, to file patent applications.

The technology has been designed and already partly implemented in Hypertec's products sold to IBM, but O'Reilly is loath to reveal more. "We are growing in confidence that we have come up with something here which could be attractive to industry giants as a piece of technology," he says.

"It's one of those extraordinary bets. We could have expended a lot of time and money developing this technology and it could have turned to nothing because we could have been doing something exactly the same as IBM, Intel or Texas Instruments. We could have found ourselves up against a brick wall."

O'Reilly observes that Australia has high upfront costs and small market size which make it difficult to put together a commercially viable business, particularly in the computer industry. The vital ingredient for a company's success is its attitude: "You have to have a world market attitude. There has to be a willingness to travel, to talk to people, to do all the things necessary to build a market position on a world scale, not just on an Australian scale, and that's hard work."

Hypertec has received "substantial support" from Austrade and the Federal Government in the form of technology research and export grants. "I think the Government is trying quite properly to aim its assistance at projects or companies that will pay off, generate a real business and employ people," says O'Reilly.

"I'm not of the school of thought that throws brickbats at the Government; it does ... what is ... reasonable, but I think it's a bit blinkered about the so-called level playing field," he says. O'Reilly cites the remarkable industry progress made in Japan and other Asian countries because of the "dramatic" support from their Governments.

"I'm not suggesting that Australia should erect barriers to entry and support subsidies. I believe you have to get out there, do it to world class and be competitive," O'Reilly says. "If you survive you survive, and if you don't you shouldn't be there. Failure to recognise that that's not the way the game is played in most of the world is a political log in the eye in Canberra. If Australia is to be anything other than a niche player in IT, something dramatic needs to be done."

O'Reilly believes the political will does not exist in Australia to help it become a serious player on the world stage. "There are semiconductor plants dotted all over the world, why not in Australia? The fundamental resources are here. The Government could attract say, a syndicate of Japanese companies to establish a 64 Kb DRAM factory and offer it a tax break, the cheapest power, water, and maybe locate it in Tasmania. Something like that could only be initiated at government level."

O'Reilly recalls the hue and cry a few years ago when the then Minister for Science and Technology, John Button, persuaded Kodak not to close its Melbourne facility by offering it financial incentives to stay. "It was a sensible thing to do," says O'Reilly. "Now Kodak exports hundreds of millions of dollars of photographic paper all over Asia and employs a lot of people."

O'Reilly agrees that a "serious, good government buying policy in place would certainly help" the local industry. But Hypertec does not source printed circuit boards locally. "This is a brutally competitive industry. We tried hard to source PCBs in Australia. If we could, we would."

O'Reilly says he wouldn't choose to live anywhere other than Australia. He owns property in Moss Vale, from where he commutes to Sydney twice a week. He has three children, and says his hobbies are irregular golf and gardening. ☐

SM'94

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OCTOBER 18, 19, 20 & 21, 1994

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2.30 pm to 5.30 pm
PCB Manufacture & Specification
APCMA speakers will address issues such as DFM, Documentation Requirements & Technology Trends
The session will also feature a forum with Panel of PCBManufacturers taking your questions.
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WED OCT 19, 1994

Elenex Hours 10 am to 6 pm

Session 2
9.00 am to 12.30 pm
Mr John Meredith, Hewlett-Packard
Implementing Concurrent Engineering

Sponsor: Machinery Forum

Session 3
2.00 pm to 5.30 pm
(NB: Part 2 in Session 4)
IPC Workshop Part 1
PCB Design, Assembly & Test
This workshop will utilise the IPC-SM-782A standard.

Sponsor: Precision Circuits

THURS OCT 20, 1994

Elenex Hours 12 pm to 9 pm

Session 4
8.30 am to 12.30 pm
IPC Workshop Part 2

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Session 5
2.00 pm to 5.30 pm
The Future in Electronics Design, Components & Soldering
Jan Vardaman, TechSearch
Mark Peo, Heller Industries
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FRI OCT 21, 1994

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Session 6
9.30 am to 12 noon
EMDG & Finance Workshop
How to qualify for export development assistance and funding. Financing equipment expansion & realising capital for growth.
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Session 7: Meet The Experts
A unique opportunity to meet and discuss your problems with our international experts one on one or in small groups. There is no cost to conference registrants but prior registration is necessary and appointments are required.
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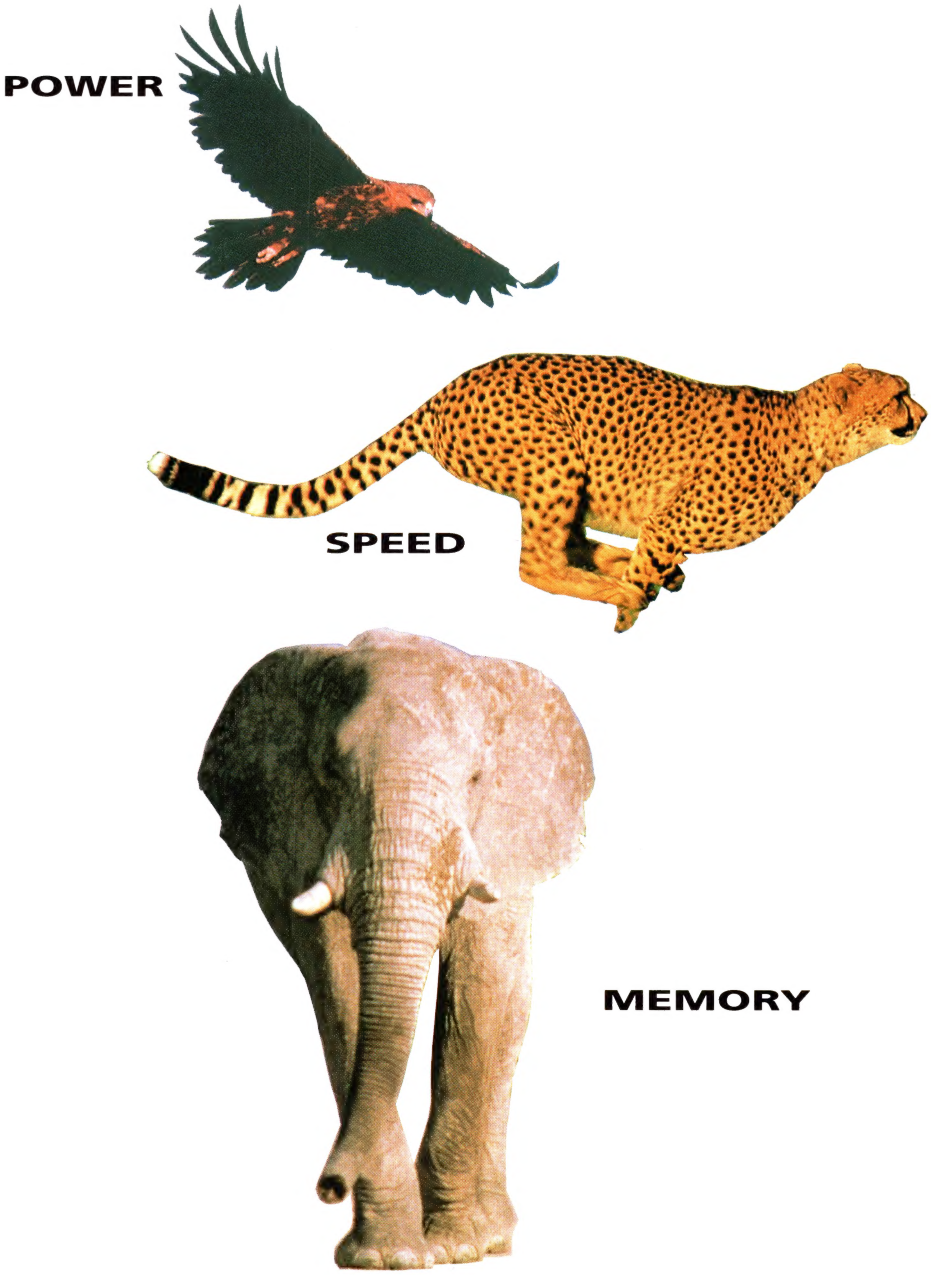

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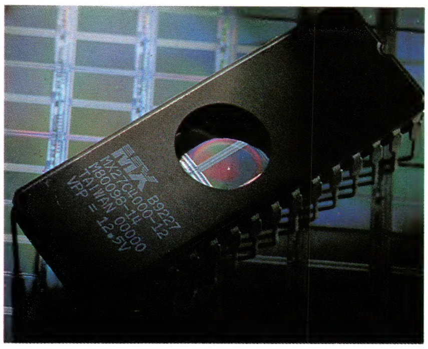

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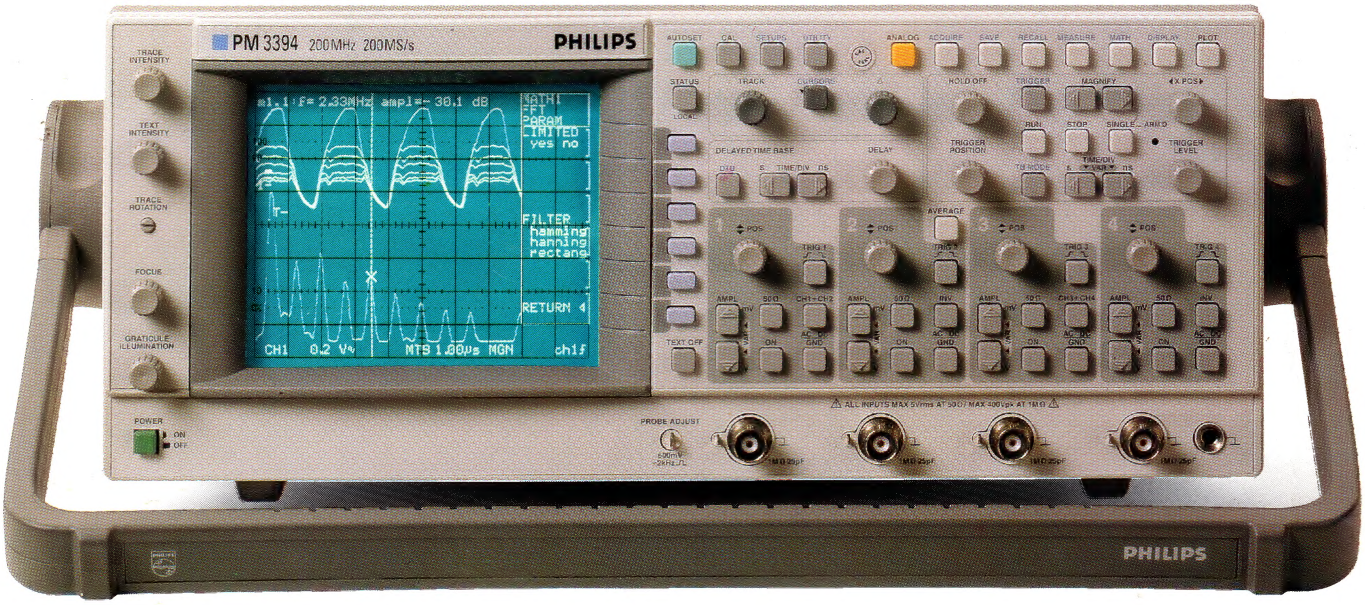

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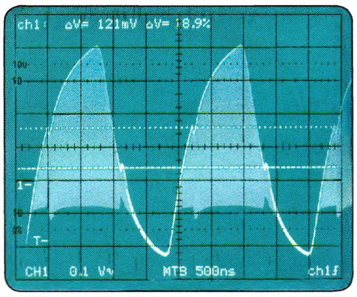

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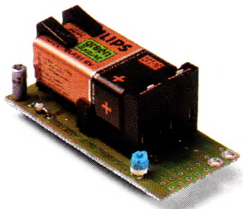

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